



WONDERS
OF
THE SEA SHORE

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WONDERS
OF
THE SEA-SHORE.

PUBLISHED UNDER THE DIRECTION OF
THE COMMITTEE OF GENERAL LITERATURE AND EDUCATION,
APPOINTED BY THE SOCIETY FOR PROMOTING
CHRISTIAN KNOWLEDGE.

LONDON:
PRINTED FOR
THE SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE;
SOLD AT THE DEPOSITORY,
GREAT QUEEN-STREET, LINCOLN'S INN-FIELDS, AND 4, ROYAL EXCHANGE;
AND BY ALL BOOKSELLERS.

1847.

LONDON:
Printed by S. & J. BENTLEY, WILSON, and FLEY,
Bangor House, Shoe Lane.



INTRODUCTION.

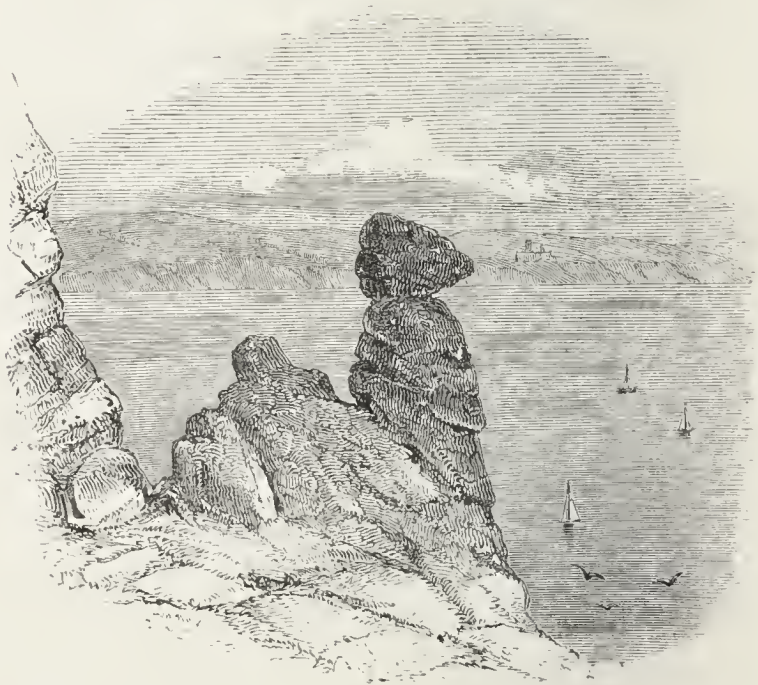
OF the many persons who go to the sea-side, either for pleasure or for health, how very few derive all the benefits which the visit is capable of giving them. It is indeed a delightful sight to view the vast ocean in its calmness, and to watch the gently swelling wave as it reaches the sand, and breaks upon it with melodious noise, either advancing towards the allotted boundary which it cannot pass, or retreating to the hollows, as it ebbs or flows, in accordance with the mysterious influences exercised by the moon. But

with others, pleasurable feelings of a higher degree are called forth, when the wind ruffles the waters, but not boisterously, and urges them with more violence to the shore. Then each ninth wave, according to popular prejudice the largest, is watched for, while others at a distance curl their tops and break upon the surface of the waters with a short and transient line of foam. More sublime, but mingled with sensations of awe and fear, is the sight when the waves, lashed into violence by the storm, toss their troubled heads on high, and present an appearance which when once seen can never be effaced from the memory. It may awaken indeed thoughts of sorrow for the dangers of those "who go down to the sea in ships, and occupy their business in deep waters;" but still the wind and the storm are but fulfilling His word.

It is not however to sights such as these, which cannot be seen unheeded, that we wish to direct attention. Little does the loungee on the sands, or the loiterer on the rock, think of the numberless objects on every side of him, full of interest and beauty, which he either totally disregards, or passes by with a careless and indifferent glance.

It shall be our task, a pleasing and a profitable one, to take him with us in a few strolls on the sea-shore, and court his attention to some few of the many things there well worthy of his observation. We shall by this means, and he will thank us for it, open his understanding still more to the wonders of the Creator's hand, and lead him to mark with reverence the vastness of that Power which has, with equal adaptation to their several places in the scale of animated beings, formed the huge monsters of the deep, and endowed with equally perfect organization the minute creature which inhabits the microscopic shell. And not only will the mind of the sea-side visitor be thus benefited, but his bodily health will be improved; for, humanly speaking, strength is soonest recovered when some gentle employment is given to the thoughts, by which they are diverted from dwelling too much on the sufferings and weakness of the body. And if this holds good with every exercise of the mind, how doubly true it is where the objects of Natural History form the occupation, the study of which is universally acknowledged to tranquillize as well as to elevate.

But if any should heedlessly remark, that the objects to which we would draw attention seem scarcely deserving of the time bestowed upon them, we reply, in the words of one who thought both more wisely and deeply than most, “Nothing can be unworthy of being investigated by man, which was thought worthy of being created by God.”—BOYLE.



WONDERS
OF
THE SEA-SHORE.

CHAPTER I.

On either side,
The white sand sparkles to the sun ; in front,
Great Ocean with its everlasting voice,
As in perpetual jubilee, proclaims
The wonders of the Almighty.

SOUTHEY'S *Roderick*.

You will this morning, you say, accompany me in a ramble on the sea-shore, in order that you may see what it is that I find so amusing and attractive in my frequent visits to it. You admire some of the sea-weeds and shells which I have there collected, but you cannot fancy

that there are such powerful charms in the spot as I discover. A few hours spent there with me, will, I have no doubt, produce a change in your opinions; and I am not without hope that the ramble will have the same effect upon you as similar ones have had upon others, and that you will be an additional evidence to the truth of what Mr. Forbes has said, that “an accidental participation in Natural History excursions has converted many an idler into a man of science.” Our excursions, indeed, will not be very scientific ones, still I shall be enabled to show you, not only a great variety of objects hitherto disregarded, which court your examination, but by drawing your attention to their wonderful formation, their habits, and their uses, I shall open a new world to your observation, and lead you to dwell with greater reverence and love on Him, the bounteous Creator of them all.

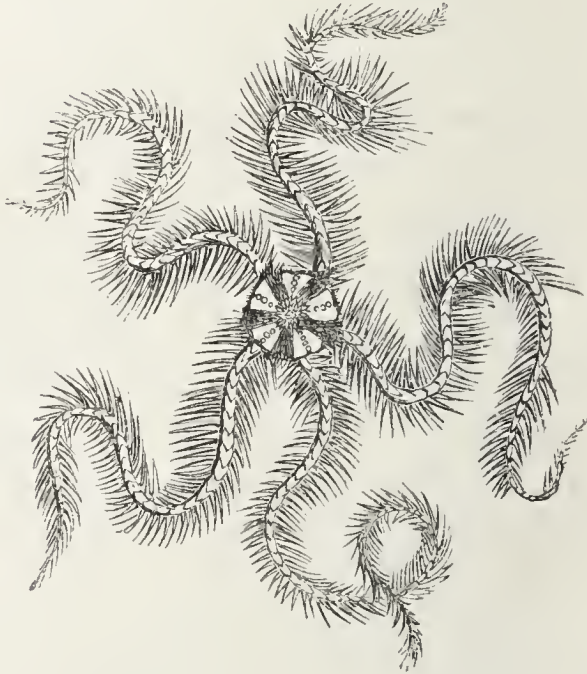
This morning is particularly favourable to us, for the wind which we heard last night, making such fitful moanings, will render our proposed excursion much more interesting than if the weather had been calm. We shall find many curious objects detached by its violence from their dwelling on the

rocks, and several creatures, usually met with only in trawling nets, will probably be thrown upon the sand. The sea still shows the effect of the late high wind; there is scarcely a breath of air, and yet the surface is much disturbed, and the waves roll heavily on the shore. This "ground swell," as it is called, is very disagreeable to those on shipboard who are not good sailors, and the appearance of the waves makes such as are unaccustomed to the sea imagine there is great danger. But though comparatively high, yet the uniformity of their size, and the regularity of the rise and fall, is such that there is no well-grounded cause for alarm; it is the short, chopping sea which is much more perilous, although the waves are not nearly so high.

Wave after wave advanced ;
Each following billow lifted the last foam
That trembled on the sand with rainbow hues.

As the tide is not sufficiently ebbd to allow us to descend with comfort to the shore, we will walk a little way on this low ledge of rocks. We need not fear that we shall lose our time: here is an object well worthy our examination,

common as it is. This is the Spiny Star-fish, or Cross-fish (*Uraster glacialis*, Forbes), known by its very angular rays and large strong spines. The name was given to the family from the five



SPINY STAR-FISH.

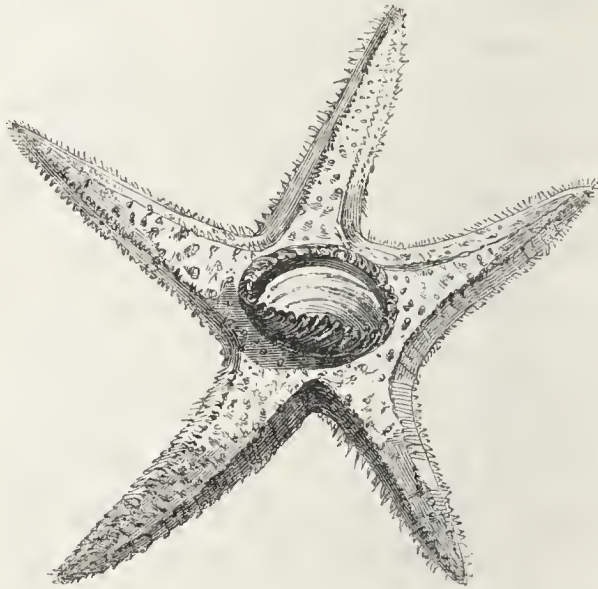
arms or rays, which correspond with the popular notion of a star. Link, a medical man of Leipsic, who first published a separate treatise on the history of these animals, in the preface to his book adopts the opinion of this resemblance, and

says, "as there are stars in the sky, so there are stars in the sea."

This species sometimes grows to a very large size, and one was found in Cornwall, by Mr. Couch, of which the largest ray was fourteen inches long, and the diameter of the whole, across both disk and rays, was thirty-three inches. But such monsters as that, are not often met with.

I will turn this on its back, in order that I may point out its peculiarities. I must do this gently and carefully, because all the Star-fish have a singular ability of voluntarily parting with their rays, and I have little doubt that if I were to take up this roughly by one of them, it would come off in my hand. Some of the family which we shall meet with hereafter possess this faculty to a most extraordinary degree, the parts which are separated retaining their power of motion long after they have been thrown off. But He, who gave this power of saving the disk in which the vital parts are situated, at the expense of the loss of a limb, which perhaps enabled them to escape from an enemy, has graciously bestowed upon them the ability of reproducing the part which was thus sacrificed. This process is slow

indeed, but certain in its end; so that it is no uncommon circumstance to find some with four rays and a part of the fifth, or with three and the parts of two others, gradually growing to their full size.



STAR-FISH.

Having succeeded in turning it without any injury, you will see the mouth in the centre, which, small as it appears, is capable of swallowing a substance much larger than you would suppose. The power of its dilation is so great that sometimes a shell-fish is swallowed whole, and not

unfrequently one may be found with the shell partly protruding. This, however, is not the only way in which they contrive to devour the fish; sometimes they suck out the juices through a perforation in the shell; at other times the mouth is applied to the edges, and by that means the animal is extracted. Now, from the very close manner in which most bivalves are shut, we are naturally led to consider how the Star-fish contrives to get at its prey. Some have supposed that it has the power of introducing a peculiar secretion within the valves, which paralyses the animal, and renders it torpid and unable to resist the attacks of its destroyer. Others have thought that it watches for the opening of the shell, then inserts one of its rays, and by means of the suckers with which it is furnished, kills the inhabitant. This latter was the opinion entertained in the days of Bishop Sprat, who tells us, in his history of the Royal Society, "that there are great penalties by the Admiralty Court upon those who do not tread under their feet, or throw upon the shore, a fish which they call a five-finger, resembling a spur-rowel; because that fish gets into the oysters when they gape,

and sucks them out.” This opinion is entertained by fishermen of the present day.

The prickly star creeps on with full deceit,
To force the oyster from his close retreat.
When gaping lids their widened void display,
The watchful star thrusts in a pointed ray.
Of all its treasures spoils the rifled case,
And empty shell the sandy hillocks grace.

Observe also the almost countless number of suckers which you see either extending themselves, or contracting, coiling and feeling about, each apparently acting without any dependence upon the others; and yet when I touch one of these singularly sensitive tubes, all in its neighbourhood are thrown into a state of agitation. If you were to take home one of these creatures,—which, as we have just seen, when left by the retiring waves seems so incapable of movement, so utterly helpless and inanimate,—and put it into a large glass jar filled with sea-water, you little imagine what would follow. Very soon the contracted rays would expand to their full stretch; these hundred feet being gradually protruded, the animal would fix itself to the side of the vessel and begin its march.

The numerous suckers become all employed, fixing and unfixing themselves alternately, some clinging thus firmly while others change their position, and by a gliding movement the Star-fish would climb the sides of the glass in the same manner as it does the perpendicular and slippery surface of the sea-covered rock.

Professor Ehrenberg, a most keen and accurate observer of all objects of Natural History, is disposed to think that the small red speck at the end of each ray is an organ of sight. This, however, is doubted by many; still I think we may not be very far wrong in concluding, that though these may not be eyes in the strict sense of the term, yet they are bestowed by the Great Creator of all to serve the purposes of vision, adapted to the peculiar wants of the animal, and enabling it to seek and avoid objects at its will.

Close by the root of that large sea-weed, not many paces from us, I see another member of this family (*Uraster rubens*, Forbes), the common Star-fish or Cross-fish, differing from the one which we have been examining. In this you will observe that the rays are not angular, but rounded, and gradually tapering to a point; the

number of them, though generally five, is occasionally six, and now and then a specimen is found with four. Many writers of Natural History, repeating perhaps the unexamined assertions of previous authors, have stated that this animal secretes an acrid liquor, which burns the skin of those who handle it. But this is not the case ; and the only way in which we can account for the origin of the mistake is by supposing that this Star-fish was confounded with the stinging Medusa, an animal widely different in appearance, but of a kindred tribe.

In Ireland, children particularly dislike the Star-fish, and have a superstitious dread of touching it, supposing it to belong to the author of evil. Dr. Drummond, of Belfast, was drying some of them in the garden behind his lodgings at Bangor, (County Down,) when he heard a child say to another in a tone of great surprise, “What’s the gentleman doing with the bad man’s hands? Is he ganging to eat the bad man’s hands, do ye think?”

The querist probably had no idea connected with fish, except as an article of food, and might naturally be not a little astonished at any person

venturing to eat what was so unprepossessing in appearance, and to him an object of horror.

This large dark green sea-weed, tinged with brown, near which we found the last Star-fish, differs from most British species, in having a strong fibrous root, by means of which it insinuates itself firmly into the crevice of the rock on which it grows, and withstands the ordinary violence of the winds. This specimen, you see, has employed its fibres in another manner, and has clasped with great tenacity a large stone which has been dislodged from some thick ooze, and is thrown here by the storm. The stem, which is as thick as an ordinary walking-stick, and covered with a kind of brown bark, is at least three feet long, in other specimens it varies from one foot to six, and the leaf (*frond*, as botanists term it) grows sometimes to the length of five feet; it has been found, though not very frequently, nearly three feet broad, but its usual breadth is from twelve to eighteen inches. The common English name is sea-girdles, and sea-hangers, but in Scotland it is more usually called tangle. The scientific appellation is *Laminaria digitata*. The second, or specific name, is given, because the frond is variously cleft



TANGLE, OR SEA-GIRDLE.

into an uncertain number of strap-shaped segments, somewhat resembling digits or fingers.

These clefts are not caused by the violent action of the winds and waves, as you might suppose, but they characterize the plant, that when growing in a still pool, and sheltered from all storms, the segments are still to be found, though they may vary both in number and extent.

The old frond is sometimes by accident entirely torn from the stem, or is so injured as to die; in these cases, botanists have observed that a reproductive power has been given to the plant, by which a new leaf is produced. The old and the new are sometimes found together, attached to each other by a narrow neck, the old one cleft to the base, and the new one, of a pale olive green, just beginning to split.

In its native element, this weed, growing as it frequently does in dense compact masses, forms a shelter for many of the smaller inhabitants of the deep, while its stem becomes the support and the nutriment of other weeds and zoophytes, and even shell-fish which grow and live upon it. But all created things, directly or indirectly, (how great a cause for thankfulness!) minister to the necessities or comforts of man. As soon as the tide shall have sufficiently ebbed, this very shore will soon

present a busy scene ; the workmen of the neighbouring farmers will be there with donkeys, carts and horses, in short, everything which can be pressed into the service, to carry away the rich harvest procured for them by the last night's storm. Those piles of sea-weed will be all carried away, and be thrown into heaps, where, decomposing under the influence of the sun, and of its own heat, it will in due season be spread upon the fields, where its fertilizing powers will cause the earth to bring forth with increased abundance the seed committed to it.

In the Orkney and Shetland Isles, and on the coast of Brittany, where the land affords but a scanty supply of fuel, the sea compensates in some degree for the deficiency, and the dried stems of this plant are plentifully used. In Norway, at the season when herbage is scarce, the young plants are boiled and given to the cattle, which thrive and fatten upon them. In Scotland, the tender stalks of the young frond are cried about the streets of Edinburgh as an article of food. Thus variously is this weed employed by man. One use, little to be expected, perhaps, remains for me to mention,—the conversion of the

stem into knife handles. "For this purpose," Mr. Neill tells us, "a pretty thick one is selected and cut into pieces about four inches long; into these, while fresh, are stuck blades of knives, such as gardeners use for pruning and grafting. As the stem dries, it contracts and hardens, closely and firmly embracing the hilt of the blade. In the course of some months, the handles become quite firm, and very hard and shrivelled, so that when tipped with metal, they are scarcely to be distinguished from hartshorn."

If you should wish to preserve a specimen of this plant, you must, before laying it between paper to be dried and pressed, frequently soak it in fresh water; when placed there, it will give out a quantity of thin slimy matter, which must be carefully wiped off. If long exposed to the sun it loses all colour, and becomes white and crisp.

I mentioned that this plant was the source of support to other things, and you see that its stem is well covered with sea-weeds. If I were to begin to examine all of them the day would be too short for the employment, I must therefore only draw your attention to one or two; we

shall meet with similar objects on other occasions, when I can point them out to you.

This pretty delicate shell, of a pale yellowish colour, about three quarters of an inch long, which has sunk both into the stem and the root, is the Blue-rayed Limpet, (*Patella pellucida*,) the animal of which feeds upon the juices of the plant, and makes itself a kind of chamber there, sinking gradually into the substance, till, according to the opinion of some, it so weakens the fibrous root, when it has chosen that part of the weed for its abode, as to cause the plant to be easily dislodged from the rock on which it grew. It is beautifully marked with four dotted lines of the richest sapphire blue, which proceed from a dark blue spot near one end, and extend lengthwise towards the opposite margin; the number of these lines vary from three to seven.

This Limpet has, in common with others of its genus, the peculiarity of adapting its margin to the surface of the substance on which it lives, and which influences its shape. This one takes its position sometimes on the leaf of the sea-weed, in which case the margin is flat; sometimes on the stem, as we see it here, when the sides are so

compressed as partly to embrace the stem, and the base becomes so uneven, that when the shell is placed on a flat surface it rocks backwards and forwards. It is not uncommon to find specimens



RHODOMENIA PALMATA.

in which the animal has moved from one of these positions to the other.

This oblong wedge-shaped purplish-red plant, with small leaves springing from the edges, (*Rho-*

domenia palmata,) is a very common article of food both for men and cattle, particularly in the north.

The Highlanders call it Duillig, a word compounded of *duille*, a leaf, and *uisge*, water; literally the leaf of the water. In Edinburgh it is cried about the streets by the name of dulse. Both the Scotch and the Irish wash the plant in fresh water, dry it in the sun, and, rolling it up, chew it like tobacco. But it is usually eaten fresh from the sea. The Icelanders, after drying it, pack it down in casks for occasional consumption, and it is then eaten, either raw with fish and butter, or boiled with milk, to which, Sir W. Hooker says, a little rye flour is added by those who can afford it. In Norway it is called sheep's-weed, sheep being exceedingly fond of it, and frequenting the shore at ebb-tide in order to obtain it. In the Isle of Skye it is used to promote perspiration in fevers. And in the islands of the Archipelago it is a favourite ingredient in ragouts, to which it gives a red colour, besides rendering them of a thicker and richer consistence. Like many other sea-weeds, when soaked in water it gives out an odour resembling that of violets, and it is said

also to communicate that flavour to vegetables with which it is mixed.

The common Limpet (*Patella vulgata*), of which we see such numbers every where around us, adheres to the rock with such extraordinary tenacity, that you are almost sure to break the shell in the attempt to detach it, unless you happen to strike it when it is a little raised, which is the case when the animal is waiting for its food. You will frequently find, after removing them, a cavity in the rock of the same form as the shell; by what means this is effected naturalists are not agreed, it is generally supposed that the animal is able to decompose the stone by means of some secretion which it discharges. The shape of the shell varies considerably, as you will observe, some being very conical, and others much flatter; the outside is occasionally the abode of the acorn-shell, or of another limpet; the inside is beautifully polished, and at the bottom is a mark like a horse-shoe, formed by the fibres of the muscle by which the animal is attached to it. Some are found jammed in crevices and hollows in the rocks, and take all the irregularities of shape which the cavity itself has. These, of course, must remain

fixed to one spot ; many others are almost, if not quite, as stationary, while some are constantly moving from place to place. The animal is sometimes, but not often eaten, being coarse, and hard of digestion. Few seas are without limpets : one found on the coast of Greenland is even more brittle than the blue-rayed specimen on the Tangle, while those of California are large and of a stony hardness.

Difficult as we have found it to remove the Limpet, that prettily marked black and white bird, the Oyster-catcher, or Sea-pie (*Hæmatopus ostralegus*), which you see flying yonder towards the shore, can twitch them off with great ease by an oblique tap with his strong wedge-shaped bill. No doubt he watches the opportunity while the shell is raised, and long before the animal can re-fix itself, it is dislodged and in the crop of the bird. During the winter the adult bird has a gorget of white on his breast. Shell-fish of all kinds are the principal food of the Oyster-catcher, but with us, notwithstanding its name, it feeds less upon oysters than upon other species, as, though they are occasionally washed up, they are generally beyond its depth ; for though it swims

well, it rarely dives except to escape an enemy. Limpets, mussels, and cockles are common prize with it. Bivalve shells, when closed, it opens by striking them at the hinge; and in the case of the cockle, it holds the shell steady with its foot and wrenches it open with its bill, as with a crow-bar. When the shores are flat, and the surface remains covered with a slight depth of water after the tide has ebbed, the Oyster-catcher finds his prey readily, as the shells of the bivalves are partially opened, and it can insert its wedge-shaped bill and extract the fish without trouble. But when the sand soon dries, and there are no rocks on which limpets can be had, it seeks its food by following the line of the water both in its retreat and in its advance; in these cases it is sometimes caught in the waves and floated out a little way, but it soon regains the land. From the quantity and closeness of its feathers it wades rather deep into the water, but as its toes are not webbed, it cannot raise the body by a downward stroke of the feet, and so take wing from deep wading. It is admirably calculated for running either on the rocks or on a pebbly beach, the feet being furnished with rough excrescences, which enable it to take firm hold

either on the slippery rock or on the uneven shore. It deposits its eggs, usually four, on the bare ground among the shingle above high-water mark, which cannot be readily seen by the passer-by,



EGG OF OYSTER-CATCHER.

as they are of a yellowish stone-colour spotted with brown. The female sits about three weeks, during which the male keeps anxious watch, and on the approach of anything which he deems an enemy, makes a clamorous noise. The signal is immediately attended to; she leaves her nest in silence, and after a circuitous flight, joins her mate in his endeavours to scold or decoy away the intruder. The young are frequently kept tame, and will associate with domestic poultry. Some years ago a flock of them were kept at the Pavilion at Brighton, where they used to run about the grass with great liveliness and activity. The inhabitants of Finland have a deep dislike to the Oyster-catcher; they suppose, when engaged in the seal chase, that these birds give notice to the seals of the approach of the hunters, and frighten away the game.

Those two objects near each other, the one shaped like a flattened bell-glass, of a dull crimson colour with green spots, and the other with pointed feelers, ranged like the petals of a double flower, are both the same animal, *Actinia gemmacea*, or Sea-anemone. When closed, it is in its quiescent state; when open, seeking its food.

Here, too, are living flowers,
Which, like a bud compacted,
Their purple cups contracted,
And now in open blossom spread,
Stretch, like green anthers, many a seeking head.

SOUTHEY.

It is worthy of observation that as we approach the limits of the animal world, many of the objects bear a near resemblance to vegetables, both in the simplicity of their construction as well as in their general appearance. This holds good particularly in such animals as these, which have not only had names assigned them in accordance with this resemblance, such as that we are looking at, Sea-anemone, others Sea-marigold, &c., but were actually classed among plants by old and less scientific naturalists. They belong to the order

Carnosi (*carnosus*, fleshy from their substance) of the Polypi family. They are extremely disagreeable to the touch, whether closed or open; in the former case they have a cold slimy feel, which is far from pleasant; in the latter the feelers appear to cause a slight irritation, arising perhaps from their roughness, as actual stinging is confined to another member of the family, *Actinia viridis*. The activity of the feelers depends probably upon the appetite of the animal, as sometimes a stick may be held within the rays without producing any effect, while at other times they close upon it immediately. They feed on shrimps, small crabs, whelks, or probably with indifference on whatever animals are brought within their reach, and whose strength or agility is insufficient to extricate them from the grasp of their numerous feelers, which can be thrown in any direction, can be greatly lengthened, are capable of being applied to every joint, and adhere by suction with considerable tenacity. Whatever is seized is conveyed to the central mouth, the soft parts are devoured, and if it be a shell-fish, the empty shell is, after a while, ejected. The size of the prey is frequently most disproportionate to the animal. "I had once brought to

me," says Dr. Johnston,* from whom I have derived much of the information which I have given you on this animal, "a specimen of *Actinia gemmacea*, that might have been originally two inches in diameter, and that had somehow contrived to swallow a valve of *Pecten maximus* (the scallop shell) of the size of an ordinary saucer. The shell fixed within the stomach was so placed as to divide it completely into two halves, so that the body, stretched tightly over, had become thin and flattened like a pancake."

This species is liable to great variation in colour and size. Those which are between high and low water mark, and are consequently exposed by the ebbing of the tide, are always covered with scattered wart-like appearances, generally orange-coloured with dusky blotches, coated with particles of broken shells, small gravel, and pieces of sea-weed; by which means, when shut, they are not readily seen in the recesses or sandy places which they prefer. This coating adheres with great tenacity, and cannot be removed by any natural causes to which the *Actinia* is exposed; but what is surely worthy of our admiration, and seems to prove the exist-

* British Zoophytes, p. 224.

ence of an instinct mercifully bestowed even on these lowest creatures, is, that the individuals which are placed in deep water, as if aware they did not require such a mode of concealment, form no extraneous covering, but leave the surface clean, which has then more vivid and varied tints, while at the same time the warts become smaller or disappear.

The Abbé Dicquemare, who studied the Actinia most carefully, says that they vary according to their contraction or expansion, presenting innumerable varieties. Their expansion is a more certain indication of fine weather than the rise of the barometer; but this cannot be practically taken advantage of except during summer, as the cold of winter drives the Actinia from the shore to the deeper waters, where the temperature is more equable and mild. They can leave their hold and remove to another station by gliding along like a slug, but with a slow and almost imperceptible motion, requiring, as Johnston observes, (*British Zoophytes*, p. 223,) five minutes for the distance of half an inch. This is their usual method of changing their locality: sometimes they reverse the body and use the feelers as feet; or

else, filling the body with water to render it more buoyant, they detach themselves, and are borne away by the random motion of the waves.

They are very patient of injuries. They may be kept without food for upwards of a year; they may be immersed in water hot enough to blister their skin, or frozen into a mass of ice, and again thawed; and they may be placed within the exhausted receiver of the air-pump, without being deprived of life, or disabled from resuming their usual functions when placed in a favourable situation. A strong light incommodes the Actinia, noise startles them, they are affected by odours, and fresh water causes them to die. These various feelings originate in their great irritability, which appear to increase according to their sufferings. They are often left exposed to the air during spring tides; but in such cases they always retain a great quantity of water, which they squirt out with force when molested.

Neither the look nor the touch of these animals recommend them as articles of food, yet Dicquemare, speaking of this very species says, "of all the kinds of Sea-anemones, I would prefer this for the table; being boiled some time in sea-water,

they acquire a firm and palatable consistence, and may then be eaten with any kind of sauce. They are of an inviting (?) appearance, of a light shivering texture, and of a soft white or reddish hue; their smell is not unlike that of a warm crab or lobster.”

“They are found in every sea, some suspended from the vaults of sub-marine reefs, others covering the more exposed sides of rocks with a sort of flower-like tapestry, some confining themselves to the smooth sands, on the surface of which they spread out their tentacula, and even withdraw under the sand when danger threatens. Each species indeed selects a peculiar haunt.”

The long flat sea-weed with curled margin, though in its younger state it is quite flat, and which with the Tangle covers the face of that rock, and the sides of this pool, is the Sea-belt or Sugar Fucus, (*Laminaria saccharina*), and though little used in Europe except as manure, is very differently estimated in foreign countries.

Thunberg informs us that this plant is prepared for the table by the Japanese, and that it is customary there, when presents are made, to lay them upon a slice of the Fucus, attached to

a piece of paper folded in a curious manner, and tied with threads of gold and silver. "This," Barrow conjectures, "may possibly have been intended to show in how high estimation this plant is held; being considered, perhaps, as the representative of those resources of sustenance which the sea so amply supplies to such nations as from choice or necessity may be led to avail themselves of its various productions."* The same author gives it as his opinion, that the Chinchou jelly of China may probably be made in part of this plant. No one, however, represents it of so much consequence as Captain Broughton;† who, speaking of the people about Endermo, says, that he always found those who lived on the opposite side of the Isthmus open to the sea, collecting *L. saccharina*, which they dried in the sun, and made up into bundles for exportation; and that a considerable trade was carried on in this weed from Volcano Bay to Matzmai; whence it is exported to Nipon. He even mentions having seen several ships loaded with it.

* Voyage to Cochin-China, p. 313.

† Voyage of Discovery to the North Pacific Ocean, p. 272.

This, as well as Tangle, is used by cottagers as a weather-glass. When the weather is dry, it is crisp and rigid, but at the approach of rain, the salt in the weed absorbs the moisture which is in the atmosphere, and the plant becomes moist and limp. It preserves these qualities for years. Many of the sea-weeds, but this more particularly, (hence its name of Sugar Fucus,) when dry, are covered with a white crystalline deposit, shaped like long slender needles, which, though of a sweetish taste, was long considered to be nothing more than a kind of salt. On analysing it, however, chemists have discovered it to be mannite, a sweet principle, differing indeed from cane sugar, but exactly similar to that procured from grapes. May not this substance, so different from what we might expect to meet with in the salt and briny deep,—which is contained in so many sea-plants, and so universally diffused,—be one among the many means employed to keep the vast mass of waters pure, and fit for the abode and support of its numerous and varied inhabitants. It is not for man, indeed, to fathom the wisdom of his Creator, or to account for all His works, yet an inquiry carried on with humility and reverence, is not

unbecoming the highest talents, and must have the effect of rendering the inquirer more sensible of the power of Him who made all things good and dispose him to worship with more earnestness, and to obey with greater care and zeal.



CHAPTER II.

In hollows of the tide-worn reef,
 Left at low water glistening in the sun,
 Pellucid pools, and rocks in miniature,
 With their small fry of fishes, crusted shells,
 Rich mosses, tree-like sea-weed, sparkling pebbles,
 Enchant the eye, and tempt the eager hand,
 To violate the fairy paradise.

MONTGOMERY.

Look at this pool, how beautifully clear and liquid, surrounded by its deep green hangings, so perfectly still, that if we stoop down we shall be enabled to see the smallest object at the bottom, for it is not above five feet deep. With very little aid from the imagination, we may see the most diversified landscape—rocks, trees, flowers, and shrubs, in miniature, while the colours of the sea-weeds and corallines rival the brightest and most varied tints of an autumnal forest.

And arborets of jointed stone are there,
And plants of fibres fine as silkworm's thread ;
Yea, beautiful as Mermaid's golden hair,
Upon the waves dispread.

If I put my arm down and remove some of the Tangle, I have no doubt that I shall find a small fish or two, as some species either permanently take up their abode in such pools, or are left there by the receding tide. Did you observe that one which darted across with great rapidity? It is the common Rock-fish, or Black Goby (*Gobius niger*). He is rarely caught in the fisherman's net ; the small pools in the rocks are his usual dwelling-place, where he can remain tolerably secure from his enemies, the larger fish, and find his own food with ease ; this he does not swallow the moment he has caught it, but carries off to his resting-place, and devours it at his leisure. There are others of his genus which prefer the sands ; and a very common one, the Freckled Goby (*Gobius minutus*), is constantly taken by shrimpers in their nets. It is plentiful also in the Thames, where the fishermen call it the Polewig, or Polly-bait. This, as its name imports, is of a pale yellowish-white colour, freckled with rust-coloured

spots. If I poke about with my stick a little lower down, I dare say I shall disturb another. No, I have removed a crab which has fallen to the bottom, we shall soon see which kind it is. It is the Four-horned Spider-Crab (*Pisa tetraodon*), but not one of the tribe with very long legs. In counting the spines, there is one above, and another below the eye which are not reckoned. That organ appears to be well protected by the spine in front of it. Like all crabs which have wart-like protuberances (tubercles), it is not very prepossessing in appearance. The back is almost covered with small sea-weeds, which make it look like a small moving forest. The front claws are exceedingly strong and thick; the hands are nearly as broad as they are long, and the fingers meet at the points, the moveable one having a small round tooth. The end of the smaller legs, called the nail, is furnished with a regular row of sharp spines arranged like the teeth of a comb. "The habits of this species," says Mr. Bell,* as far as I have had an opportunity of observing them, are

* History of British Crustacea, p. 25, which, like his other works on Natural History, though profoundly scientific, may be read with the greatest pleasure even by the unscientific.

curious. They are found concealed under the long hanging fuci (sea-weeds) which clothe the rocks at some distance from the shore, in which situation I have taken them among the Bognor rocks. They congregate in vast numbers at the place I have just mentioned, in the prawn and lobster-pots. I have seen probably thirty amongst the refuse of one of these, attracted no doubt by the garbage which is placed in them as bait. Like all the slow-moving Crustacea, they are very liable to be covered with small fuci, so that they are sometimes completely concealed by a mass of these marine plants growing upon their surface, when their roots find a secure hold amongst the villous coat of the shell and limbs. Their movements are extremely slow and measured, and they are very timid, concealing themselves under the fuci, and remaining for a time almost motionless. But, notwithstanding their timid and lazy character, they seize the object of their anger by a sudden and unexpected snap, and nip with great force, holding on with extraordinary firmness and tenacity, although unable, from the bluntness of their pincers, to inflict a wound."

I must not quite discontinue my search, because

I think if I remove some of this tangle I shall find another fish or two, which have probably hid themselves in some of the crevices, and will not be easily frightened into leaving them. One has escaped me, which indeed it is almost impossible to hold, from its peculiar slipperiness; it is well named the Butter Fish (*Murænoïdes guttata*): an eel is not more difficult to grasp, on account of the quantity and the thickness of the slimy secretion with which it is covered. Independently of this, it shifts its situation with great quickness, swims very rapidly, and creeps into holes which you would think were not sufficiently large to contain it. It is not unlikely that we may find it under some stones or sea-weed on the shore; it seems to suffer no inconvenience from these situations, as it will live for many hours with no other moisture than what such covering supplies. It lives upon marine insects and their spawn. The Greenlanders, who are not particular about their food, dry this fish and eat it, though hard and with very little flavour; on our coasts it is used as bait.

Differing from this, but frequently the inhabitant of a crevice during the ebbing of the tide,

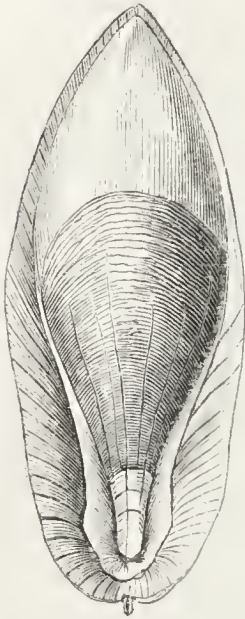
is the Shanny, or Shan (*Blennius pholis*). “ This fish is destitute of a swimming-bladder, and is, therefore, confined to the bottom of the water, where it takes up its residence on a rock or stone, from which it rarely wanders far, and beneath which it seeks shelter from ravenous fishes and birds; for cormorants, with their long and sharp beaks, drag multitudes of them from their retreats and devour them. When the tide is receding, many of these fishes hide beneath the stones or in pools, but the larger individuals quit the water, and by the use of their pectoral fins creep into convenient holes, rarely more than one in each, and there, with the head outward, they wait for a few hours until the return of the water sets them at liberty. If discovered or alarmed in these chambers, they return by a backward motion to the bottom of the cavity. These circumstances show that the Shanny is retentive of life; in confirmation of which, I have known it continue lively after a confinement of thirty hours in a dry box; notwithstanding which it soon expires in fresh water.”*

Being now upon the shore, we will first examine

* Yarrell's Fishes.

that small cave, where the waves have carried such a miscellaneous collection of weeds, pieces of wood, broken reeds, shells, &c.

The most prominent object is the shell of the Cuttle-fish (*Sepia officinalis*), of which there are so many and of all sizes. The animal to which it belongs is particularly disagreeable in appearance, looking like a dirty-white bag of jelly spotted with



SHELL OF CUTTLE-
FISH.

red, of an oval shape and about a foot long. The shell or plate is internal, not only protecting the vital parts, but by its peculiarly light structure contributing to the buoyancy of the animal in water. It is tolerably hard in its texture, but one side is composed of exceedingly delicate layers of shelly matter, standing up perpendicularly to the plate at some little distance from each other, and kept apart by innumerable little pillars,

which are only to be seen by the aid of the microscope, but when viewed by it present a beautiful appearance. It was formerly much used for pounce, is still employed, when very finely

levigated, for tooth powder, and is much liked by cage birds, who eat it instead of sand. It belongs to an order of molluscous animals, which takes its name (*Cephalopods*) from the circumstance that the feet are placed round the head. These feet possess great muscular power, and are furnished on the inside with rows of horny suckers, with which the animal seizes on its prey, and adheres firmly to any object with which it comes in contact. So tenacious is its grasp that, in the larger species, it is frequently necessary to cut off the part before it can be separated from the substance on which it has fixed its hold.

The mouth, also, in form and substance resembles the beak of a parrot, except that, contrary to the shape of the mouth of the bird, the upper part shuts into the lower, the power of the feet, and the strength of the sharp and horny beak, render the animals formidable opponents, especially as they are carnivorous, and their courage and cunning are equal to their rapacity. In addition to the feet and mouth, which may be considered rather as weapons of attack, the animal possesses a singular means of defence by being enabled to discharge from a bladder-shaped sack a fluid of an

inky colour, which darkens the water around it, and keeps it concealed from its enemies.

The most familiar examples of this contrivance is to be found in this very Cuttle-fish, and the Sepen (*Loligo*) of our own seas. This substance is frequently called ink, from the use to which it was anciently applied, when dried it affords an excellent pigment, and has been supposed to be one of the materials of the celebrated Indian ink of China, but this is doubtful. “It was hardly to be expected,” says Dr. Buckland in his *Bridgewater Treatise*, “that we should find among the petrified remains of the ancient world (remains which have been buried for countless centuries in the deep foundations of the earth,) traces of so delicate a fluid as the ink which was contained within the bodies of extinct species of Cephalopods that perished at periods so incalculably remote; yet the preservation of this substance is established beyond the possibility of doubt by the recent discoveries of numerous specimens in the lias of Lyme Regis, in which the ink-bags are preserved in a fossil state, still distended as when they formed parts of the organization of living bodies. So completely are the character and qualities of this

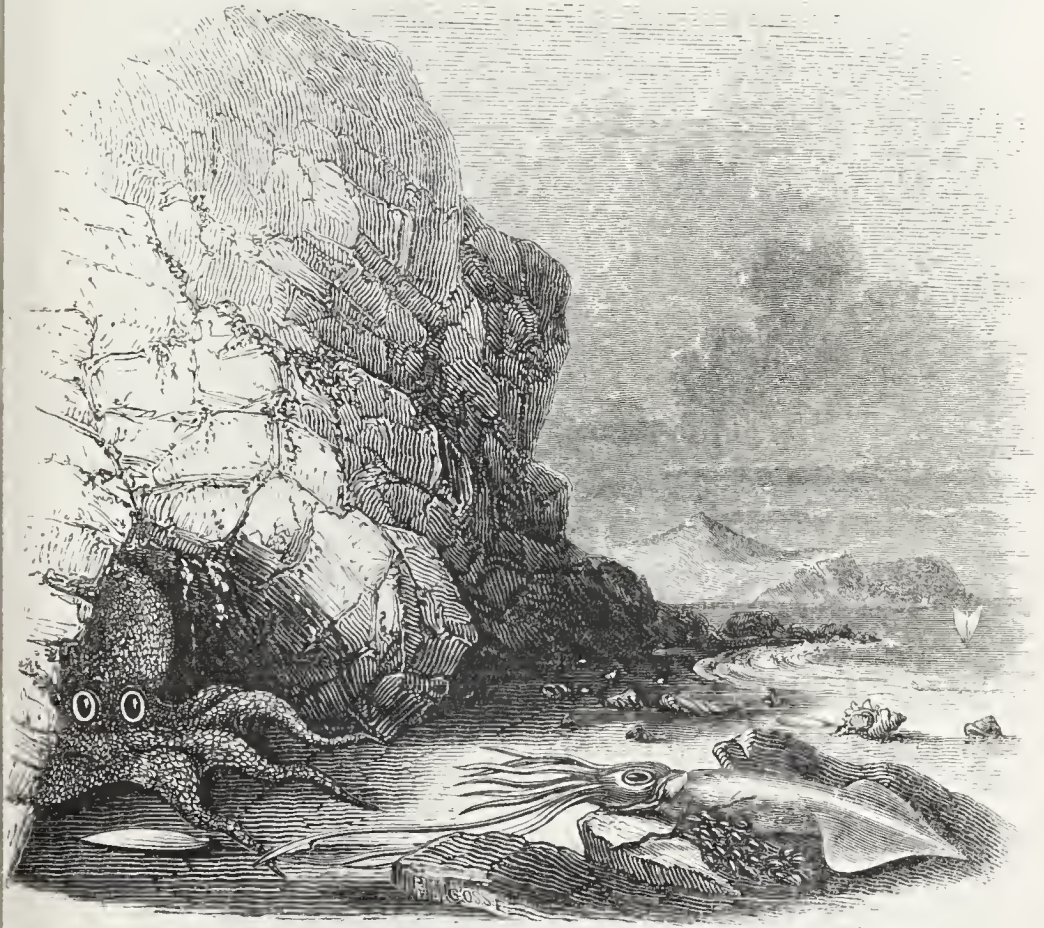
ink retained in these specimens, that when, in 1826, I submitted a portion of it to my friend, Sir Francis Chantrey, requesting him to try its power as a pigment, and he had prepared a drawing with a triturated portion of this fossil substance; the drawing was shown to a celebrated painter, without any information as to its origin, and he immediately pronounced it to be tinted with sepia of excellent quality, and begged to be informed by what colourman it was prepared. The common sepia used in drawing is from the ink-bag of an oriental species of Cuttle-fish.”—*Bridgewater Treatise*, pp. 304, 305.

The eye of the Cuttle-fish is very strong and hard, and when extracted is of a brilliant pearly tint; in some parts of southern Europe they are worn in necklaces instead of pearls. It is exceedingly fierce and voracious, and from its depredations on the fishes enclosed in floating-nets, it is a source of great annoyance and serious loss to the fisherman, who from its wariness and agility, find it difficult to capture. The author of the article “Cephalopoda,” in the Penny Cyclopædia, observes, “We well remember in our youth going far out with an old fisherman of Dawlish, to visit

the floating-nets he had laid for pilchards. As we looked down into the clear blue water we could see that the number of fish entangled was great ; but to the discomfiture of the fisherman, who was eloquent on the occasion, almost every fish was locked in the embraces of a Cuttle-fish, plying his parrot-like mandibles to some purpose. The fisherman, who seemed to regard these unbidden guests as an incarnation of all evil, carried a capacious landing-net, but so quick was the sight of these Cephalopods, so ready were they in letting go, and agile in darting back or sideways clear of the net, that, though the greedy creatures held on till the last moment, the fisherman did not secure above three out of the crowds that had spoiled his haul."

There is frequently thrown up on our shores, and I have no doubt but that we shall meet with it in our walk, another member of the same family, the Poulpe (*Octopus vulgaris*), which being destitute of any fin, and without an internal shell, is even more disagreeable to look at than the Cuttle-fish. "It bears," says Mr. Gosse, in his *Introduction to Zoology*, "upon each of its long arms a hundred and twenty pairs of suckers, making the astonishing aggregate of nearly two thousand

in all. Their application to the human skin is said to cause inflammation and subsequent pain.



POULPE.

It has the reputation of being occasionally highly luminous.”

Notwithstanding its want of fins, the Poulpe is enabled by working its long arms to swim with rapidity. Its more usual movement, however, seems to be "by crawling upon its fleshy arms, either at the bottom or among the rocks of the coast, in the recesses of which it lies in wait for its prey." Crabs, lobsters, and other crustacea, are thus seized and dragged to the crooked beak, against whose ruthless gripe their shell affords a very insufficient protection.

When enraged, it appears the Poulpe will not scruple to attack man himself, and proves on such occasions a most formidable adversary. Mr. Beale has described an encounter he had with a Cephalopod, probably of this genus, while occupied in searching for shells among the rocks of the Bonin Islands. He was much astonished at seeing at his feet a most extraordinary looking animal, crawling towards the surf, which it had only just left. It was creeping on its eight legs, which, from their soft and flexible nature, bent considerably under the weight of its body, so that it was lifted by the efforts of its tentacula only a small distance from the rocks. It appeared much alarmed on seeing him, and made every effort to escape. Mr. Beale

endeavoured to stop it by pressing on one of its legs with his foot ; but although he used considerable force for that purpose, its strength was so great that it several times liberated its member, in spite of all the efforts which he could employ on the wet and slippery rocks. He then laid hold of one of the tentacles with his hand, and held it firmly, so that it appeared as if the limb would be torn asunder by the united efforts of himself and the creature. He then gave it a powerful jerk, to disengage it from the rocks, to which it clung so forcibly by its suckers. This effort it effectually resisted ; but the moment after, the apparently enraged animal, lifting its head with its large projecting eyes, and loosing its hold of the rocks, suddenly sprang upon Mr. Beale's arm, (which he had previously bared to the shoulder for the purpose of thrusting it into holes in the rocks after shells), and clung to it by means of its suckers with great power ; endeavouring to get its beak, which could now be seen between the roots of its arms, in a position to bite.

A sensation of horror pervaded his whole frame when he found that this monstrous animal had

fixed itself so firmly on his arm. He describes its cold slimy grasp as extremely sickening, and he loudly called to the captain, who was similarly engaged at some distance, to come and release him from his disgusting assailant. The captain quickly came; and taking him down to the boat, during which time Mr. Beale was employed in keeping the beak of the Octopus away from his hand, soon released him, by destroying his tormentor with the boat knife, when he disengaged it by portions at a time. This Cephalopod measured across its expanded arms about four feet, while its body was not bigger than a man's fist. The species is usually called by the whalers, the "Rock Squid."*

The common Poulpe infests all the coasts of Europe, destroying an immense number of fishes and crustaceans; and is said to have drowned persons by entwining them in its foul embrace. Its flesh is occasionally used as human food, but it is so hard and tough, that it must be well pounded to be rendered tolerably digestible. It has been rather vaguely asserted, that some species of this genus attain a very vast size in the

* Hist. of Sperm Whale.

Indian seas, and are able to swamp a boat, by throwing over it their immense arms; but these reports have not, as yet, been confirmed by the observation of any modern naturalist.”



CUTTLE-FISH AND EGGS.

Attached to the stalk of this sea-weed there is something else belonging to the Cuttle-fish, though you would little suspect so from its appearance.

You will not be surprised at hearing that it is called a bunch of sea-grapes, for the objects are about the same size, black, oval, sharp at one end, and attached to each other by foot-stalks. They are the eggs of the fish, from which the animal will in due time come perfectly formed.

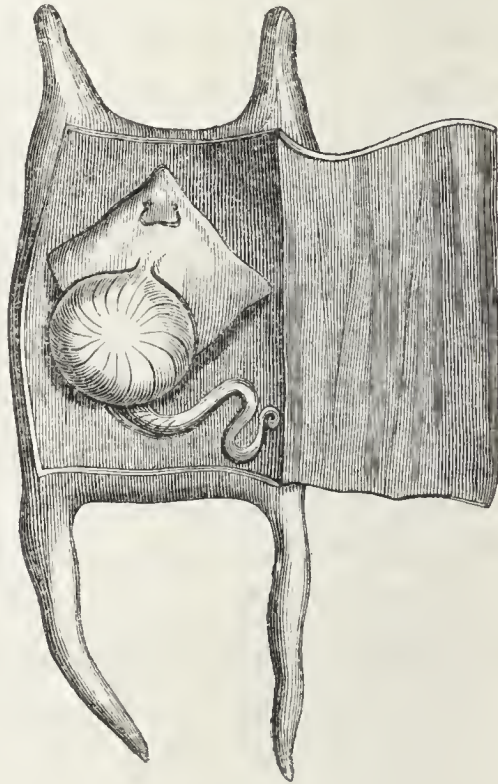
Cast your eyes a little to the right, and you will see another "singularly shaped substance, which at first sight you will probably imagine to be a large beetle, and on examination will pronounce a detached portion of some marine plant. Both suppositions are equally erroneous; you see before you neither sea-weed nor insect, but the outer integument of the egg of the Skate. These purses, as they are called, when cast by the fish, may be described as oblong, leathery, or almost horny pouches, convex on both sides, and internally hollow, containing a substance bearing a close resemblance to the yelk and white of a bird's egg. The four horns which project from the angles are much longer in their natural state than in this broken specimen; two of them are slightly hooked; these latter seem designed to attach the incipient animal to the weed at the bottom of the sea. When the fish has attained its perfect state,

it escapes at one end, which opens readily from within, and it is in this empty state that the purse is generally cast ashore. Sometimes after a violent storm they may be found still containing the imperfect animal. Another fish common on our shores, the Dog-fish, is propagated in the same way; but the purses are of a yellowish colour, and instead of being furnished with horns, terminate in elastic sinewy cords many feet long, which, in all probability, become entangled in the weeds at the bottom of the sea, and, while the tender animal is protected from the attacks of other marine animals by its horny covering, keep it fixed to its moorings in deep water.”* However these may mislead by their appearance, you may soon discover what they are by burning a portion, as the odour given out by an animal substance is peculiar to it, and differs widely from that which arises from the combustion of any vegetable.

On the coast of Cumberland they are called Skate-barrows, from the resemblance in shape to the common four-handed machine by which two men carry goods. Here is one, which from its weight I think contains the animal; I will cut

* Johns' Botanical Rambles.

it open, and you will then see both the appearance and position of the young. When full-grown, the Skate is very voracious, eating everything it



PURSE OF SKATE.

can catch, any sort of common fish or shell-fish ; and so powerful are their jaws, that they can crush with great ease the strong shell of the crab. The tails of all are furnished with strong spines,

and its mode of defence is very effectual. "The manner in which it defends itself shows its consciousness of the formidable weapon it carries on its tail. When seized, or terrified, its habit is to twist its long, slender, and flexible tail round the object of attack, and with the serrated spine, tear the surface, lacerating it in a manner calculated to produce violent inflammation. Some authors state that it is capable of striking its weapon with the swiftness of an arrow into its prey or its enemy, when with its winding tail it secures its captive."*

The teeth, when young, are broad and flat, but as the male acquires age, those nearest the centre begin to alter in form, and become pointed. I have had the teeth of the young fish rolled up, and offered me for sale as a very curious shell.

As an article of food there are few fish, perhaps, about which there is such a diversity of opinion; when in season it is firm and very palatable, out of season it becomes soft and woolly. During Lent the French boats convey great quantities from our coasts, preserving them by moistened sand.

* Yarrell's British Fishes, vol. ii. p. 443.

CHAPTER III.

THIS round object, bearing a strong resemblance to a Hedge-hog, is the Sea-urchin, or Sea-egg (*Echinus esculentus*). It looks now like a ball of spines, but when these are removed, as they are at the death of the animal, a more wonderful piece of mechanism perhaps never met your view. And yet I hardly know that I am justified in using the words, for everything around us is so astonishing when closely examined, that we are apt to say the last seen object is the most so, because it is the freshest in our recollection. In works of art, however beautiful, and however complicated the machinery may be, one inspection develops the whole plan,—a second examination shows no more than the first. But not so with the works of our Omnipotent and adorable Creator; every succeeding research, even into the same object, only discloses to us fresh cause for admiration and surprise, and fills us with the impression

that, notwithstanding all previous discoveries, and all the acuteness of observation which we ourselves possess, the wonders of the works of our God are, like Himself, infinite and illimitable.

When the spines are removed the hard covering, usually called the shell, is seen. It is composed of five segments: on each segment are two rows of half-round knobs, on each of which a spine is placed, working on it by a ball and socket-joint, so that it can turn in every direction. Between these two rows are two channels crowded with small holes, through which the sucker-feet can be either let down or drawn in. Besides the larger spines which have been mentioned, there are multitudes of smaller ones which project in all directions. "Every segment is composed of many pieces of a regular six-sided figure, which are dovetailed into each other with beautiful precision; an admirable arrangement by which the growth of the animal can be permitted. For if the shell were composed of one continuous piece, formed as it is by deposition from the surface of the animal, it is plain that every layer deposited would diminish the interior, while the contained animal would be ever increasing in size. But as it is, every one of

these six-sided pieces is increased by layers on its inner surface, each layer being a little wider than the preceding, and thus each piece gradually enlarges, (and consequently the whole shell,) while at the same time the definite form of each is exactly retained."* There are above three hundred plates of one kind, and nearly as many of another, bearing on their surfaces above four thousand spines, each spine perfect in itself, and of a complicated structure, and having a free movement on its socket. "Truly," says Mr. Forbes, "the skill of the Great Architect of Nature is not less displayed in the construction of a Sea-urchin than in the building up of a world."

All acts with Him are equal ; for no more
It costs Omnipotence to build a world,
And set a sun amidst the firmament,
Than mould the dew-drop."

MONTGOMERY.

The mouth, which is on the flattened under-surface, contains five hard, sharp, polished teeth, not unlike those of a squirrel ; these meet in the centre, and the whole apparatus is known by the fanciful name of Aristotle's Lantern. "The food of these

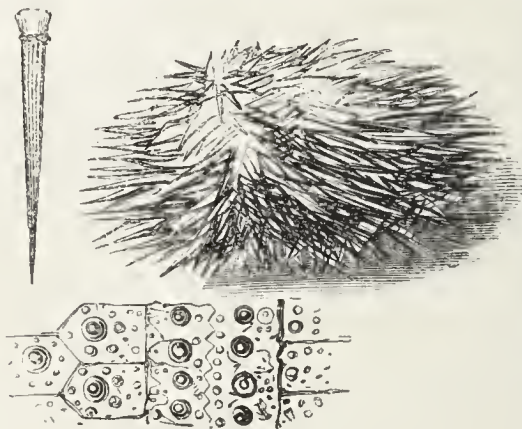
* Gosse, vol. ii. p. 380.

creatures is altogether animal ; and though the Sea-urchin does not seem at first sight very well qualified to pursue or to seize prey, yet its organs doubtless correspond to its wants and instincts. Small shell-fish appear to be its chief diet ; and if an animal of this kind be but touched by one or two of the sucker feet, its doom is sealed ; the hold is never relinquished, other suckers are applied to it until it is passed round to the mouth, whose formidable jaws instantly crush the shell.”* This species is generally of a reddish or purplish colour, with white spines occasionally tipped with purple. Cottagers who live near the sea frequently have it for a chimney ornament.

It is occasionally eaten in England, and abroad is commonly so : with the ancients it was a great favourite both raw and cooked in different ways. Such of the Sea-Urchins as live on hard surfaces moor themselves by means of their suckers, and thus adhere very firmly to the rocks. When they are left by the tide on the sand, if it be wet they sink more or less deeply into it. The depth to which they sink is apparently regulated by the tempestuous or calm state of the weather. You

* Gosse, Introduction to Zoology, vol. ii. p. 380.

have picked up, I see, a very small one of a dirty white colour; which had you seen it when alive, you would not, except perhaps from its size, have recognized in its present state. It is then of a bright powdery green, very like the colours seen on the wing-cases of some species of beetles, and



GREEN-PEA URCHIN.

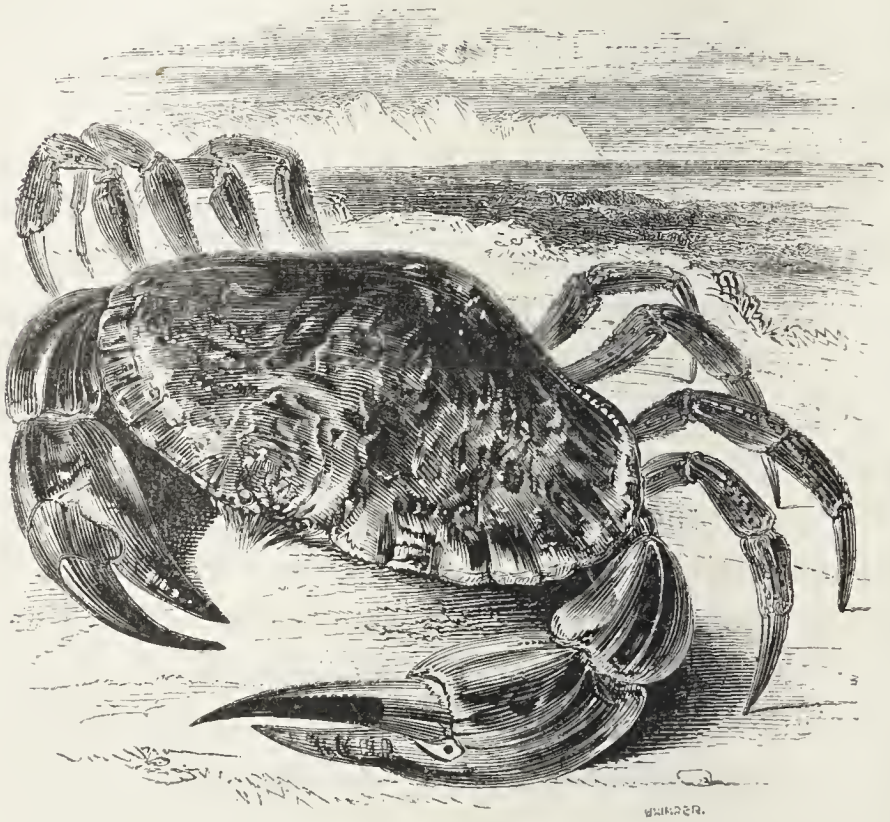
from that circumstance is called the Green-pea Urchin. This, as well as all the family, are the food of gulls, who thrust their hard beak into the shell and suck out the animal. There are several

other kinds, which take their names from the shape of the shell, such as the Purple-heart Urchin, and the Fiddle-heart Urchin, and the King of the Sea Eggs, the most beautiful, but the rarest of the British species, found only in deep-sea fishing off the Zetland Isles, called by the fishermen the Piper, from the club-shaped spines, which they liken to the drones of a bag-pipe; and here we see the shell of the Common Heart-Urchin, or Mer-

maid's Head (*Amphidotus*), is strewn about in great abundance. Fossil specimens of the genus are very common both in flint and chalk ; in the latter the spines are frequently found of considerable length ; both them and the shell are beautifully preserved.

If I can succeed in turning up this large stone, I am almost sure to find either a crab or a fish. The spot is muddy and sandy in consequence of that little stream of fresh water, which has gradually worked itself a channel, and brought away with it a portion of the soil, which has deposited itself all around. In the winter time, after the melting of the snow, the water rushes down with considerable violence, as we can see from the size of the stones which have been rolled down, and from the roughness of the course. One part of the stone has sunk deeper than the other, so that the upper part forms a delightful shelter to whatever may have taken refuge under it. I have at last turned it ; something I see is moving, but the water is too thick to enable me to make out what it is. There is a crab, however, walking, or rather running away very rapidly ; it is the Common Shore-crab (*Carcinus Mænas*),—the sea is

rather too far off, or it would instantly go to it ; if unmolested it will seek another stone, or perhaps



COMMON SHORE-CRAB.

bury itself in the muddy sand. Like all crabs, they are cunning, especially in avoiding their enemies, frequently seeking places most difficult

of access to their pursuers. And when lurking in pools of water left by the tide, and partially concealed in the sand, they keep the upper part of the shell, including the eyes, exposed, so as to watch for the approach of their small living prey, on which they spring with great activity. They are, however, timid and wary, and will not move if they discover that they are watched." * When disturbed they frequently, like many insects, and some animals, the opossum in particular, put on the appearance of being dead. If their retreat to some place of safety be cut off, they become courageous, though, probably, it may be only the courage of despair, and, throwing up their claws fiercely, endeavour to pinch with their fingers, which they do very strongly in proportion to their size. This fighting propensity has procured for them on the coast of Normandy the name of *Crâbes enragé*. They sometimes will sacrifice their claws by leaving them in the hands of the person by whom they have been seized, that they may themselves escape. The same peculiarity was observed sometime ago in some Land-crabs,

* Bell's Crustacea, vol. i. p. 79.

which were at the garden of the Zoological Society, and the apparent ease with which they parted with their smaller legs in order to escape from any one who injudiciously took them up by these members, was very remarkable. They did not seem to regard the loss at all, and ran away on the remainder of their legs as if nothing had happened.

This species, contrary to the usual habits of the tribe, can remain for a considerable time out of the water, remaining active for many hours, and probably for days together, if it have the opportunity of burying itself in sand which is wetted with seawater. Cuvier records an instance of some which lived for seventeen days buried in the ground, covered with a little sea-weed, and the earth over them beaten hard. They will also, which is not usual with marine animals, survive their immersion in fresh water for several hours.

This crab is much eaten by the poorer classes on the coast, and great numbers are also brought to the London markets, the flavour being very delicate and sweet. On some parts of the coast a small black variety is found, which the fishermen consider as a distinct species, distinguishing

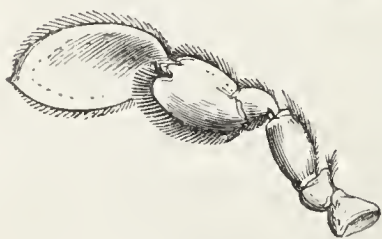
them as the black and green crab. This variety is found in deeper water, and is believed to interfere with the success of their prawning, by either destroying the prawns or frightening them away from the pots. It is certainly merely a variety.

Its food consists principally of the fry of fish, of shrimps and other crustacea, but it will also feed upon dead fish, and almost any other animal substance. Indeed, the most common way of taking these crabs at Poole, where numbers are caught by the fishermen's children, is by tying a mass of the intestines of either a fowl or of any fish, to a line, and hanging it over the quay; the crabs seize upon this bait, and are drawn up in considerable numbers. Mr. Hailstone states that they attack mussels, and that he once saw one carrying about on its hand a mussel which had closed its shell upon it.

The morning cheers our outset; gentle airs
Curl the blue wave deep, and bright the summer sun
Plays o'er the world of waters. All the flocks
Of ocean are abroad: like floating foam
The sea-gulls rise and fall upon the waves.

SOUTHEY.

Crabs are of two kinds, dwellers upon land and dwellers in the sea; the habits of the former are too curious not to mention, I will speak of them by and bye. Sea-crabs may be divided into the walking and the swimming, the former rarely going into deep water, the latter never coming to



HIND LEGS OF WALKING AND SWIMMING CRAB.

the shore voluntarily in an adult state. There is a young specimen of the swimming kind under this stone, which I will pick up and show you. It is the Velvet Swimming Crab (*Portunus puber*), so called from the thick downy covering of the legs and also of the shell, except the elevated parts. It shows even now, one characteristic of its tribe, great pugnacity; and if its power was equal to its

will, my fingers would pay dearly for venturing to handle it. Observe the final feet, not like the rest, sharp-pointed, but flattened, oval, fringed at the edge, suited for swimming, and transformed into true oars. From the peculiar motion of their

hinder feet they have been called Fiddlers. In the great economy of nature these have their allotted part, and like many other of the crustaceous tribe, not only furnish food to various fishes, but are the scavengers of the deep. Linnæus and Pennant give the name of *cleanser* to this species, and "it may be concluded that they do perform such an office in no very limited degree from the localities in which they abound, and the numbers in which they are found congregated. In the refuse of the prawn and lobster pots, where they resort for the purpose of feeding on the often half-putrid garbage which is placed there as bait, and amongst the mass of miscellaneous filth sometimes brought up by the dredge, hundreds of these *cleansers* are found.*

There is one object still left at the bottom of this little mud hole, it is one of the Star-fish tribe, but very different in appearance from those we saw upon the rocks; — it is the Common Brittle Star, and well it deserves its name. "Touch it," says Mr. Forbes, "and it flings away an arm; hold it, and not an arm remains attached to the body." They congregate in great

* Bell's British Crustacea.

numbers on the edges of scallop-banks, and I have seen a large dredge come up completely filled with them; a most curious sight, for when the dredge was emptied, these little creatures, writhing with the strangest contortions, crept about in all directions, often flinging their arms in broken pieces around them, and their snake-like and threatening attitudes were by no means relished by the boatmen, who anxiously asked permission to shovel them overboard, superstitiously remarking that "the things weren't altogether right." They prey upon little shells and crabs, and in their turn are a favourite food of the cod-fish, in whose stomach great numbers of them are frequently found. I cannot refrain from giving you, from the same amusing naturalist, an account of the largest and most beautiful of the tribe the *Luidia fragilissima*, which is sometimes two feet across.

The rays vary in number, either five or seven, —no specimen has been found with six. After speaking of the wonderful power which the *Luidia* possesses, of "not merely casting away its arms entire, but of breaking them voluntarily into little pieces," he says, "This faculty renders the preservation of a perfect specimen a very difficult

matter. The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal powers, I spread it out on a rowing bench, the better to admire its form and colours. On attempting to remove it for preservation, to my horror and disappointment I found only an assemblage of rejected members. My conservative endeavours were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disk, and a diskless arm. Next time I went to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which article, star-fishes have a great antipathy. As I expected, a *Luidia* came up in the dredge, a most gorgeous specimen. As it does not generally break up, before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce *Luidia* to the purer element.

Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not,

but in a moment he proceeded to dissolve himself, at every mesh of the dredge, his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision.”—*Forbes' History of British Star-fishes.*

“The screaming sea-fowl, widening ring o'er ring
Till heaven grew dark ; then wheeling on the wing
Landward they whiten all the rocks below,
On diving, melt into the gulf like snow.”

What can be more elegant and graceful than the movements of yonder large bird, which now skims along the surface of the water uttering its shrill screaming cry, now rests its silver breast and rides upon the curling wave, or winnows the air with its large fan-like wings. It is the Common Gull (*Larus canus*), and belongs to that restless, noisy, voracious family which is found in every part of the globe, inhabiting alike, shores scorched by a tropical sun, or dwelling amid the frozen icebergs of the north. In the more solitary and craggy parts of the coast you may see gulls and other sea birds in such vast numbers as to

resemble swarms of locusts; and when at rest, covering the rich dark brown of the rocks, and converting them into silvery grey.

“ Now seek their food among the finny shoals,
Swift darting from the clouds, emerging soon
With slender captives glittering in their beaks ;
These in recesses of steep crags constructed
Their eyries inaccessible, and trained
Their hardy broods to forage in all weathers.”

“ Gulls have been named,” says the Bishop of Norwich, in his delightful book, *The Familiar History of Birds*,* “ and justly so, the scavengers of the sea, for nothing comes amiss to their voracious appetite; loathsome as may be the putrefying carrion left upon the beach, to the Gull it is just as acceptable as a meal of the finest and freshest fish. On either they will gorge almost to suffocation; and in that state may be taken up torpid and insensible. Some years ago, in riding with a friend on the sea-shore, we espied a Gull lying motionless on the sand, apparently dead; but, as its eyes were open, life was clearly not extinct. Suspecting it to be a wounded bird, we alighted

* Vol. ii. p. 236.

to examine the extent and nature of the injuries it had received; but not a drop of blood was to be seen, neither was a feather ruffled. After having, therefore, handled it for several minutes without its evincing the slightest symptoms of vitality, beyond the opening and shutting of its eyes, we threw it into the air, when, to our inconceivable surprise, the apparently dead bird expanded its wings, and, tucking up its legs, flew off with the utmost composure and steadiness.

Nature has amply provided them with means for their wandering lives. While the Cormorant is pent up in his cavern, and most of the other sea-birds are driven to their rocks and crags, during heavy gales, it matters as little to the Gull as to the Gannet that the weather be fair or foul. Cold has no effect upon him, provided, as he is, with a coat of the softest down; light, too, as he is, he tops and rides over the waves without an effort, and his wide wings insure him a safe conveyance from every peril, save that of the gun, to which he may be exposed."

The same amusing writer who had been delighted at watching the Gulls on Stach Island,

near Holyhead, on which a lighthouse has been built, tells us that a pair of these Common Gulls had “established themselves on a bit of a plateau, that made one giddy to look at, and quite tremble for the fate of their offspring, a little grey, downy-covered nestling, with about half an inch between his toes and destruction, for a breath might have blown it over; but there stood the little tottering bird quite at its ease, so well tutored, apparently, that when the old ones successively returned with food, it betrayed none of those emotions common to young birds, which would certainly have thrown it off its balance; no tremulous motion of its flappers, no impatient stretching of its neck, no gapings of its mouth, there it stood, motionless, as if conscious of the dangers attendant on even the slightest bustling display of satisfaction. It was impossible not to feel something like pity for the dull life it was doomed to lead in such a cradle; it being evident that from the moment of its quitting the egg-shell to that hour, the choice of standing on its right or left leg, or a cautious putting forth of one foot before the other, to the extent of a few inches, was the only source of

amusement or variety within its reach. It was curious to observe the proceedings of many of the older birds. The din was incessant, and some seemed quite exhausted with screaming or hearing others scream ; for they might be seen flying off from the main body to a retired crag or niche, as if to rest awhile in perfect silence.

Now and then, indeed, as if by mutual consent, the uproar entirely ceased, and the whole body settled themselves on a rocky inclined plane interspersed with grass, just below the light-keepers' dwellings, which formed their nursery establishment ; for there, in every stage of growth, hundreds of young ones were moving about.

“ No doubt each parent had a perfect knowledge of its own offspring, though, generally speaking, there were no signs of recognition ; to all appearance, old and young seem to mingle, without much reference to relationship ; and a stranger might suppose there was a common property in the nestlings. The only sign of parental attachment was, that an old bird would now and then fix its eye in a more pointed manner upon some one of the living grey puff-balls of downy feathers, and then, suddenly opening its mouth, deposit at

the feet of the fledgeling a crawful of half-digested shrimps and softened crabs.”*

That flock which is just hovering at the very edge of the water, consists of the Laughing Gull (*Larus ridibundus*), and is perhaps the handsomest of this elegant species of birds. Its head and throat deep brown; the shoulders and back grey; the legs, beak, feet, and a circle round the eyes, bright red; the breast and under-part of the tail and body are white as snow. During winter the plumage changes to white, excepting the head. It is formed for rapid flight, as, though weighing but eight or nine ounces, it measures fourteen and fifteen inches in length; the expansion of the wings equals the Common Gull, though the body is so small. It frequents all parts of the coast during winter; but, unlike other Gulls, who place their nests on the tangled grass of the cliffs and rocks of the sea-shore, it chooses for a breeding-place low, swampy, inland ground. Early in the spring the Laughing Gulls assemble in vast numbers and seek favourable places to build their nests. From these inland habits they have been

* Stanley's History of Birds, vol. ii. p. 246.

called Peewits, or Lapwing Gulls : the inhabitants of Orkney call it their sea-crow. Some of their habits much resemble the Crow tribe, especially the Rook. When ground has been newly turned up near their breeding-places, these Gulls and Rooks may be seen together, rendering, by the large quantity of worms and grubs they destroy, great service to the farmer. In the middle of the county of Norfolk, about twenty-five miles distant from the sea, is a large piece of water called Scoulton Mere. In the middle of this is a boggy island of seventy acres in extent, covered with reeds and a few birch and willow trees. This place has from time immemorial been a favourite resort of these birds. During the breeding-season a man and three boys find constant employment in collecting their eggs for sale in the markets of Norwich and Lynn. They are eaten cold, like the eggs of the Lapwing, but have rather a coarse flavour. The person who sells these eggs gives fifteen pounds a year for the privilege of collecting them ; as many as a thousand have been obtained in one day. These eggs vary much in colour, size, and shape, some being of a pale-blue, or olive colour, and others thickly

covered with dusky spots. The young birds are also eaten, but are not so much esteemed as they were formerly, when great numbers were annually fattened for the table. These are the "Sea Gullies" of the ancient entertainments. In the household book of the fifth Earl of Northumberland, begun in 1512, "Sea Gullies" are among the delicacies "for his lordship's own mess;" and they are charged at one penny, or three halfpence each. These Gulls were fattened on the refuse of the slaughter-house, and we should think would not suit the more refined tastes of the present day. Although the general food of the Gull is small fishes, insects, and worms, it will prey upon all kinds of animal substances that may happen to be cast on the sea-shore. In fishing villages they sometimes are useful as scavengers. Quantity rather than quality seems to be the object with the whole genus. These greedy habits sometimes lead to their destruction, as they have been known to snatch at the pilchard and other bait of the fisherman, and become his prey by swallowing the hook. In a state of captivity the Gull will eat bread and meat, and if turned into a garden will almost wholly maintain itself by eating slugs,

worms, and other insects. It is readily tamed, and various anecdotes could be related of its friendly association with other animals. An egg of the species we have been describing was taken off the coast of Cornwall, by the crew of the Vigilant revenue-cutter, and kept in a blanket, near the fire-place, for about ten days. A young Gull, was then hatched and reared by the crew, and for many years lived quite tame in the possession of a smith at Dartmouth. It swam in the river every day, and looked out for the fishermen, who used to throw small fish to it.

I once had in my possession a very fine Gull, about which I was a little anxious when I first bought it, on account of a cat and dog, which were also part of my household. As to the latter I was indifferent, because I did not expect he would interfere in any way with the new comer; neither should I have felt much alarm about puss, in the event of a fair fight, but I thought it possible she might take the Gull at a disadvantage and do it some harm, if not kill it, particularly as she was a remarkably active bird-catcher, as well as mouser, frequently bringing her spoils into the house. Knowing how powerful first impressions are, I

grasped the cat firmly, keeping its legs well confined, and directed the lid of the basket in which the Gull was, to be opened sufficiently to allow him to put out his head. I then held the cat near, and, as I expected, the Gull gave her three or four smart pecks with his bill, which probably slightly hurt puss, and, at all events, very much frightened her, she little expecting such treatment. The wings were then cut, and he was turned into the garden. In a very short time they were all good friends, and frequently within a few inches of each other on the same grass-plot, the Gull, the dog, the cat, and a young kitten, were all lying together. Not that the bird ever made any attempt at intimacy, though he had a notable example set him by the dog, whose great amusement was to take the kitten in his mouth and carry her about the garden or into the house. The mother never interfered with this proceeding, but, like the Gull, used to look on quietly. How far such a mode of being carried, was agreeable to the kitten I can hardly say; at first certainly it was not liked, either from its novelty, or because Muff did not mouth, (I can't say handle) her with sufficient gentleness. After awhile she seemed quite recon-

ciled to it, and looked for it as a matter of course, as when she met him she laid herself down to be taken up by him. These gambols, however, ceased with her kitten-hood.

The principal food of the Gull, independently of the worms and grubs which he found in the garden, was fish, of which he always appeared very fond. But the sprat season was his delight, and it was singular to see the rapidity with which he would swallow these fish, and the number he would eat, uttering now and then a sort of chuckling noise, expressive, I suppose, of his gratification and thankfulness. In whatever position the sprat was caught by him, if not so placed that the head could be swallowed first, it was turned the right way almost as quick as thought. How wonderful then, not merely the sensibility of the organ of touch in his bill, which enabled him so instantaneously to discover the position of the scales of the fish, but the instinct also which directed him to swallow his food in the only method by which its passage down the throat could not injure him.

He sometimes came into the house, but not frequently, and if his breakfast was either delayed or forgotten, he used to walk to the spot under the

kitchen window where he was generally fed, and would stand and chatter till his wants were supplied. He soon, however, lost the silvery appearance which the Gull presents on the sea-shore, and his plumage became ragged and dirty; and I frequently regretted that he had been taken from his free and wandering life, to end his days with mutilated wings in a town-garden.

From the mass of all kinds of weed collected here, I have pulled out this long, dull green, extremely tough and leathery specimen. It has you see round knobs at intervals throughout the whole length, which vary from the size of a hazel-nut to that of a walnut. It is the Knotted Fucus (*Fucus nodosus*), named by the Norwegians Knop-tang, a plant which, like most others, is much affected by its place of growth. When in deep water it is frequently many feet in length, and the knobs very numerous and large; when in shallow water, occasionally left by the tide and exposed to the sun, it is not above a foot long, and the seed receptacles are crowded and of a yellow colour, which is sure to attract the eye. From this circumstance it is called in the Orkneys, Yellow-tang. These knobs or bladders are vessels containing a

small quantity of air, and which serve, no doubt, to keep the plant in a buoyant state. This is the more evident, from our knowing that the deeper the water, the longer the plant is, and the air-vessels are proportionably more in number and larger, and consequently are enabled to give that additional support which the lengthened size of the plant requires. These air vessels are exceedingly tough, so that when dashed against a rock by the violence of a storm they remain uninjured; the pressure of the fingers has no effect upon them, and even when trod upon they require considerable force to break them: when put into the fire they burst with considerable noise. In some parts of the kingdom the plant is known by the name of Sea-whistles, from the custom of children converting these air-bladders into whistles by cutting them in a particular manner. It is preferred above all other sea-weeds in the manufacture of kelp, and on that account receives in the Hebrides the name of Kelp-wrack.

Those thick, round, bushy tufts, of a brown and somewhat stiff sea-weed, which grow around the pond at short intervals, is a parasitic conferva, (*Polysiphona fastigiata*), which is so attached to

the Knotted Fucus as to be rarely found on any other; and on some coasts it is equally rare to find this fucus of any considerable size, without being thickly enveloped with this conferva. When young it is of a dark purple colour, but changes with age, or when dry, to black; the fruit, which is pear-shape, grows at the end of the branches.



CHAPTER IV.

THIS empty gaping shell once belonged to the *Solen ensis*, or Razor-shell, so called from its resemblance in shape and size to that instrument, it is one, perhaps, of the most dexterous and expeditious of all burrowing animals. By means of its great muscular foot, which is about half the length of the shell, it excavates a hole to the depth of some feet, and remains concealed in this retreat, usually within a few inches of the surface.



SOLENS ENESIS.

The fishermen, who use them both for food and bait, take them by means of a slender iron rod with a barbed head like a harpoon. Armed with

this he treads carefully backwards over the sand left bare by the retreating tide, and finds the holes in which the Solen lodges, by watching the little jets of water thrown out by the animal, who, being alarmed by the shaking of the sand, contracts its body. Guided by these, he plunges his rod into the sand, and generally succeeds in piercing the animal and dragging it from its retreat. But should he fail in his attempt, he well knows that to try again would be useless, for the animal instantly works its way far out of his reach.

Another mode of taking them is as follows:—The fisherman throws into its hole a small quantity of salt. Although an inhabitant of salt water, the pure salt produces so irritating an effect on the extremity of its body, that it quickly mounts to the surface; the fisherman snatches hastily at it, and if he succeeds in seizing it firmly, makes good his capture; but if not sufficiently active, and the animal escapes, the application of fresh salt produces no further effect; either it is not sensible to the additional infusion of salt, or, which is most likely, the instinct of self-preservation causes it to put up with the inconvenience rather than be taken. The movements of this animal are

confined to rising to the surface of the sand in which it has formed its hole, and again sinking to the bottom. This movement is no doubt produced by the action of the foot, which forms itself into a sharp point in its descent, and when it remounts is enlarged as much as possible, to form a resting-point for the purpose of raising the shell to the surface. It is not supposed that the animal ever leaves its hole of its own accord, although it may possess the power; but it is certain, according to the observations of Réaumur, that if forcibly removed it can re-enter its abode. The hole which it forms, is always perpendicular.

We shall probably find some larger shells lying about, which belong to the *Solen vagina*, and from the curious hinge and beautiful polish, they will be well worth preserving. I have seen one converted, by the aid of a little ribbon and gum, into a very pretty netting-case. The fingers that employed the new contents of the shell could not be more active in their movements than its former inhabitant, the nimble-footed and sagacious Solen.

“O trace in Nature’s most minute design,
The signature and stamp of power divine,

Contrivance intricate, expressed with ease,
Where unassisted sight no beauty sees,
Muscle and nerve miraculously spun,
His mighty work, who speaks, and it is done."

Look at this rock, so thickly covered with small mussels that they appear almost countless in num-



MUSSELS.

ber, and seem as if they had been arranged with the greatest care by one who well knew how to econo-

mise space. They abound on all rocky shores, where they are generally found moored by their coarse beard to rocks, and such other marine substances as are exposed at some period of the tide, but always covered at high-water.

The Common Mussel (*Mytilus Edulis*), is too well known to need description, and is to be met with in great abundance on almost all our coasts, though particular localities are celebrated for more than ordinary excellence. "I must, in justice to Lancashire," says Pennant, "add that the finest Mussels are those called Hambleton Hookers, from a village in that county. They are taken out of the sea, and placed in the river Weir, within reach of the tide, where they grow very fat and delicious." The Mussel, although usually wholesome, is at times the cause of severe though temporary illness. Different reasons have been assigned for this poisonous property, and many signs have been noted, by which it is said the unwholesome state of this shell-fish can be detected,—a yellowness of colour—an extremely meagre appearance—partial corruption — a diseased state of the animal—a small crab or insect found between the valves of its shell. Other observers have ridiculously attri-

buted the effects to the change in the phases of the moon ; but, if we are to believe a French physician, who made many experiments, all these guesses are wrong. According to this author, the ill effects are caused only after the Mussels have been feeding on the spawn of the Star-fish ; this appears to the eye merely a shapeless lump of jelly, but after a few days it is a living mass of infant Star-fish. The time of the year during which this spawn is cast is from the end of April, or beginning of May, to the end of July or beginning of August ; from this arises the common observation, that Mussels are only poisonous during those months in which the letter *r* is not found. This spawn, according to our author, is so venomous and caustic, that it causes great pain, swelling, and inflammation, even to the hand if handled at this season ; the rubbing the part with vinegar is recommended as a cure. In spite, however, of various experiments, it is still doubtful whether the true cause has been discovered.

Thus much appears, that whenever indigestion occurs after eating Mussels, some ill effects are experienced ; but this has seldom, or very rarely, taken place when they have been eaten with

vinegar; and they are much more wholesome cooked than otherwise.

When an individual is *musselled*, the effects are very alarming; the body, head, and face swell to a frightful extent, and in a few hours the skin is covered with a bright scarlet eruption; the cure is attempted by means of an emetic, and afterwards some aromatic drink, and vinegar and water; this brings on a profuse perspiration, which soon relieves the patient.

The Mussel is used by our fishermen for bait.

In some parts of the Mediterranean great attention is paid to the multiplication of this animal. At the port of Torento, in the kingdom of Naples, they drive into the sand a number of long poles, to which the spawn of the Mussel becomes attached. In the following August, when they have attained the size of almonds, they are taken to the mouths of the brooks and small streams which fall into the gulf; here they are left until October, when they are taken back to the sea, and in the following Spring they are considered fit to eat. This change from the salt to the fresh-water and back again, is said to improve their flavour and colour.

Near Rochelle they are kept in tanks, preserves in which the salt-water remains at rest.

The species found in the Straits of Magalhaens (Magellan) is well-flavoured and nutritious; and it is not improbable that it ministered in a degree to the woeful wants of Byron and his wretched companion, after the disastrous wreck of the "Wager." "Having thus established," says that officer, "some sort of settlement, we had the more leisure to look about us, and make our researches with greater accuracy than we had before, after such supplies as the most desolate coasts are seldom unfurnished with. Accordingly we soon provided ourselves with some sea-fowl, and found Limpets, Mussels, and other shell-fish in tolerable abundance."

Captain P. P. King (*Voyages of the Adventure and Beagle*), mentions the Choro (*Mytilus Choros*) as among those shell-fish of the island of Chiloe which are more particularly worthy of notice.

"It is often found," he says, "seven or eight inches long. The fish is as large as a goose's egg, and of a very rich flavour. There are two kinds, one of a dark brown, the other of a yellow colour; but the last is the most esteemed. The manner

in which the natives of this island cook shell-fish is very similar to that used for baking in the South Sea Islands, and on some parts of the coast of New Holland. A hole is dug in the ground, on which large smooth stones are laid, upon them a fire is kindled. When they are sufficiently heated, the ashes are cleared away, and shell-fish are heaped upon the stones, and covered first with leaves or straw, and then with earth. The fish thus baked are exceedingly tender and good; and this mode of cooking them is superior to any other, as they retain within the shell all their own juices.”

The beard of the Mussel, though curious in its structure, is of no utility to man; but that of a fish of the same family, the Pinna, is frequently of sufficient length to be spun. The threads are extremely fine, very strong, and of equal thickness throughout; fishing lines are made of it, which are much valued for their strength; about thirty fathoms may be bought for tenpence. Gloves and stockings are also made of it; two pairs of the former may be seen in the British Museum. But the beard of this, is nothing in comparison with that which has been furnished by its Creator to the monster Clam, and by which it is securely fixed to

the rocks and defies the storms. So tough and strong are the tendons of this cable, that it can only be separated by repeated strokes of the axe.

Small seed pearls are very frequently found in Mussels. They once had a great reputation for their medicinal virtues, but this was at a time when every production of nature was pressed into the healing-art. A most curious list might be formed of the different substances used by early practitioners, every one of which was an infallible remedy for some disease ; so varied and so extraordinary were they, that the most richly furnished druggist's shop would not be able to make up a prescription could such a one be found. The fresh-water Mussel (*Unio*),* was once very celebrated for them, and Pennant remarks, that "*Mya Margaritifera* of Linnæus (*Unio elongatus*), is noted for producing quantities of pearls ; and that formerly there were regular fisheries in many of our rivers to obtain them. As many as sixteen have been taken from one shell. The Esk and the Conway were famous in this way. The latter river, in the

* "The king shall drink to Hamlet's better breath,
And in the cup an 'union' shall be thrown."

days of Camden, was remarkable for them. Sir Richard Winn of Gwidir, Chamberlain to Catherine, Queen of Charles the Second, is said to have presented her Majesty with a Conway pearl, which is to this day honoured with a place in the regal crown. The river Irt, in Cumberland, also produced them ; and Sir John Hawkins, the circumnavigator, had a patent for fishing that river. Britain, indeed, had early acquired a reputation for its pearls, though Pliny speaks of the pearls of our island as small and ill-coloured, and refers to the breast-plate which Cæsar himself had brought home, and dedicated to Venus Genetrix in her temple, adding that he wished it to be understood that the offering was formed of British pearls.

Ireland has produced pearls of considerable size and some value, especially in the rivers of Tyrone and Donegal. “The poor people,” says the author of a paper in the Philosophical Transactions for 1693, “in the summer months go into the water, and some with their toes, some with wooden tongs, and some by putting a sharpened stick into the opening of the shell, take them up, and although by a common estimate not above one shell in a hundred may have a pearl, and of

these pearls, not above one in a hundred be tolerably clear, yet a vast number of fair merchantable pearls are offered for sale by those people every summer assizes. One weighed thirty-six carats and was valued at 40*l.*, but it was foul, and so lost much of its worth. Another single pearl was sold by a miller for 4*l.* 10*s.* to Lady Glenanly, who put it into a necklace, and refused 80*l.* for it from the Duchess of Ormond." Pennant, who quotes from the abridgement of the Philosophical Transactions, speaking of the last century, when these large Irish pearls were procured, says, "We have seen some lately of considerable size, fair shape, and pretty good colour."

In the old curious translation of Hector Boetius, by Bellenden, (Edin. 1541,) the following notice occurs of British pearls:—"In the horse-mussillis are generit perlis. These mussillis airlie in the morning (when the lift is cleir and temperate) openis thair mouthis a little above the watter, and maist gredelie swellis the dew of heaven, and efter the measure of the dew thay swellie they conceive and bredis the perle."

You will scarcely believe, I dare say, that the perforated piece of wood which you have just

picked up, has probably formed part of some foundered vessel or of yonder distant pier, and that the holes in it are the work of a shell-fish. But such is the case, and the animal whose habit it is to thus bore for itself a dwelling is, from the mischief it causes, an object of anxious interest to those who construct submarine works.



THE SHIP-WORM.

The animal of the *Teredo* (Ship-worm,) is a long, worm-shaped creature, living in a tube of a

shelly substance, which it forms for itself in making its way through the wood which it pierces. With the assistance of the jaws it cuts into the timber, and at the same time lines the hole it makes, with a shelly substance, which is gradually formed into a tube, the creature occupying that part which is most deeply sunken in the timber; in directing its course it generally excavates according to the grain of the wood, but in some instances it crosses it.

In Holland, as you know, a great part of the country is below the level of high water, and to prevent the irruption of the sea, immense dikes have been formed along the coast; these are framed on the side towards the sea by large masses of sand, while to the landward they are strengthened by means of strong piles driven into the ground, and wattled together. These piles were once discovered to be pierced in all directions by this destructive worm, and to such an extent as to endanger their safety: had it not been for a timely notice of the mischief, immense tracts of country would have been laid under water, and irrevocably lost. I have occasionally seen a piece of floating timber so perforated as scarcely to bear being handled;

several such specimens are in the British Museum. Ships are frequently destroyed in tropical seas from the same cause, and probably the foundering of many a gallant vessel, unheard of and unknown, has been the work of the silent and insidious Ship-worm. Fortunately the species cannot live in fresh water, or our bridges would have but a brief existence.

To counteract the injury which they would otherwise do to submarine wooden works, nails closely driven into the submerged part of the timber, seem to be the best safeguard hitherto applied. In this manner the new piles of the Southampton pier have been protected after the former ones were destroyed by the burrowing habits of the Ship-worm. In what manner the animal performs its wonderful operation is not quite satisfactorily accounted for. It is likely that in this, as in other excavating shell-fish, the currents of water produced by the vibratile cilia of the animal, as noticed by Mr. Garner, are the principal agents.

This shell-enclosed worm, which Linnæus has emphatically, yet not undeservedly, styled the misfortune of ships, is said to have been introduced

into our seas from the East within little more than a century. They are now common in all the seas of Europe. The soundest and hardest oak cannot resist them; but, in the course of four or five years, they will so drill it, as to render its removal necessary.

The storm of yesterday has driven for refuge to the cliffs near which we are walking, some Stormy Petrels (*Procellaria pelagica*). These birds are the smallest of the web-footed tribe, about the size, you see, of the Swift, and not unlike it in appearance. They are known by sailors as Mother Carey's chickens, and it is said this singular name was given to them by the crew of Captain Carteret's ship, from an old woman of the name of Carey, who had the unenviable reputation of being considered a witch of great power. They are not welcome visitors on board any vessel, as their appearance is believed to forebode a storm. "That storms do frequently occur soon after these birds are seen, is certainly true; but the cause probably is, that, instinctively feeling the approach of a gale, they are disquieted, and anxiously waiting its arrival, therefore hover round the ship, which they imagine may shelter them from its

fury, for, unlike the Gull and some other sea-birds, they seem to dislike the war of elements, and to this dislike may probably be attributed the otherwise unaccountable circumstance of their being so often found even many miles inland.”* A few were once taken in the streets of Coventry, and several in Berkshire and Oxfordshire. They do not, however, always follow ships for shelter alone, they frequently play about vessels for the sake of the scraps of grease or food which are thrown overboard. One is said to have accompanied a ship from the Channel to the very shores of America, picking up or examining everything which fell from the vessel. It was observed to be much more clamorous during the night than the day. They are well adapted for flying, being light, and the stretch of the wing full fifteen inches. They skim the surface of the water with equal grace and ease, and touch it so regularly with both wings and feet, that they appear as if running on all fours.

Here ran the stormy petrels on the waves,
As though they were the shadows of themselves.

* Stanley's Birds, vol. ii. p. 260.

“The Stormy Petrel,” says Mr. Gosse, “will follow in the wake of a vessel for days together, apparently without sleep or even rest. The greasy particles in the dish-washings, crumbs of bread, &c., which are constantly being thrown overboard, afford food to these birds, who eagerly examine the surface of the water in the wake for whatever floats. I have, during a calm, amused myself by feeding them; picking off little bits of meat, and throwing them into the water, which the Petrels would instantly discover and pick up. The bits of fat swam, and the bird flying over them would descend close to the surface, put down its little web-feet to paddle the water, keeping the wings expanded, and take the morsel up with its beak, rising into the air to eat it. If a bit of lean were thrown down, it would of course sink, and the birds would dive after it, not first alighting on the surface, but going right under, perpendicularly from the air. I saw some go down to the depth of two feet or more, the wings continuing expanded all the time. They would come out perfectly dry, and mount into the air perpendicularly, just as they went down. One of them having got hold of a piece too large to be

swallowed, instantly flies away sideways to a long distance out of the ship's wake, to eat it free from interruption ; for they sometimes chase each other as chickens do when any one of them gets a morsel of unusual size."*

Australia, which abounds in objects of natural history, differing from all others in the hitherto known world, presents us with a singular species which has been discovered in Norfolk Islands. This burrows in sand like the rabbit, lying hid in the holes by day, and sallying forth in the evening in quest of food. Their reason for concealing themselves appears to be well founded ; for no doubt this is the same species met with in the other remote islands of the Southern Indian Seas, spoken of as living in perpetual dread of another of its own genus, the great Black Petrel (*Procellaria equinoctialis*) ; and well it may, for its sable enemies are incessantly looking out for its heart and liver, on which alone they feed, leaving the rest of the body untouched."†

Mr. Macgillivray, who visited the Hebrides in 1840, remarks that this bird abounds in St. Kilda ;

* Gosse's Introduction to Zoology.

† Stanley's History of Birds, vol. ii. p. 259.

indeed the poor people of that island prize them so highly that it is proverbial with them to say, "Deprive us of the Petrel and Fulmar, and St. Kilda is no more." The island of Soa is the principal breeding-place, where, as well as in several spots among the other islands of the group, it nestles in the crevices of the rocks and cliffs. The bird sits very close upon the nest, from which it will allow itself to be taken by the hand, vomiting, on being handled, a quantity of pure oil, which the fowlers carefully preserve, as it is considered an efficacious remedy for wounds, and the bird is allowed to escape. The Petrel is extremely fond of all greasy substances, on which it will entirely live if such food comes in its way.

Mr. Scarth, when in Orkney, caught a Stormy Petrel on her nest, and preserved her alive for three months in a cage, feeding her by smearing her breast with oil, which she sucked from the feathers, drawing each feather singly between her bill. When the oil was placed in a saucer in the cage, the bird would dip its feathers therein, and then suck the oil from them.

A gentleman who examined the stomach of a Stormy Petrel, found half an inch of a common

tallow candle, and the size was so disproportionate to the bill and throat of the bird, that it seemed wonderful how it could have swallowed it.



THE STORMY PETREL.

It feeds also upon small fishes, and shell-fish found about the extensive masses of sea-weed which float upon the surface of the ocean.

The Faroese islanders make use of the flesh

coarse and unpalatable as it is, for food ; nay, even make it servicable for fuel. And so full and impregnated with oil does the whole body seem to be, that in some of the most remote islands of the Hebrides, the inhabitants actually form them into candles, by merely passing a rush through the body and out at the beak, which is found to burn as well as if dipped in tallow, or any other grease.

We shall find more of that little shell which you have just picked up, if we dig a little into the sand, which frequently covers it, or among the small washed up shingle about high-water mark. It bears the inelegant name of the Sea-louse, or Louse-Cowry (*Cypræa pediculus*) ; there is nothing very remarkable in its appearance, though it belongs to that well-known and beautiful genus so remarkable for the richness of their colouring. “ Arranged,” says Mr. Sowerby, “ in almost every possible variety of spots, patches, rings, lines, bands, and clouds.” They are met with in all climates, but, as is usually the case, the most beautiful are the inhabitants of tropical seas.

It is not often, on account of the place of their abode, that we are enabled to learn any particulars of the animals which inhabit shells ; the following

remarks, therefore, of Mr. Samuel Stutchbury, an eye-witness of what he relates are not without interest.

He had an opportunity of examining many individuals of *C. Tigris*—Tiger Cowry, the most commonly met with, perhaps, of the whole genus—at the Pearl Islands; and informs Mr. Broderip* that “those Cowries lived there in very shallow water, and always under rotted masses of madrepores. They were never to be seen exposed to the sun’s rays. On lifting one of these masses, a Tiger Cowry was generally observed with its shell entirely covered by the large mantle, which was mottled with dark colours, the intensity of which the animal seemed to have the power of changing; for the colours varied in the same light, and in the same medium, after the manner of the hues on a turkey’s comb. On touching the mantle it was immediately withdrawn within the shell, which became exposed in all its brilliancy.”

I cannot refrain from mentioning one or two of the most admired and highest priced of this beautiful genus, though the selection, except with reference to the value, is somewhat difficult.

* Zoological Journal.

Cypræa princeps, the Brindled Cowry from the Persian Gulf, is supposed to be unique; it is in the collection in the British Museum; the value set upon it is consequently very great.

C. aurora, the Morning Dawn, or Orange Cowry, is also of considerable rarity, particularly when without a hole in the side. This hole is formed by the natives of the Friendly Isles, &c., where the permission to wear it is a mark of the highest dignity. The largest of the specimens in the British Museum was valued at 65*l.*, the second at 35*l.*

C. Mappa, Geographical Cowry, so called from a fancied resemblance to a map in some of the species; varies very considerably both in colour and marks; some are nearly white with the lines reddish-brown, and the dorsal line broad and placed on the side, the base and sides spotted with purple, the teeth and mouth bright yellow, and the extremities pale violet.

From these rare ones, we descend to the common *Cypræa moneta*, the Trussed Chicken, from its form, or the Money Cowry, of which large quantities are annually sent to the Western African coast, where they are a circulating medium, two

hundred and fifty being about the value of a shilling, but in Bengal about ten times the number are worth that sum. It is deeply to be regretted that even now, in spite of all efforts on the part of this country to prevent it, this Cowry is the medium of barter for the liberty of man, a certain weight of them being given in exchange for a slave.

You know this well, the Periwinkle, or Pinpatch (*Turbo litoreus*), the latter name peculiarly appropriate from the instrument used to extract the fish, and the protective covering (*operculum*) which closes the mouth of the shell. It is a favourite food with the lower classes, and abounds on most of our rocky shores. The Swedish peasant thinks that when these shells creep high up on the rocks they indicate a storm from the south. The animal of the Marble Turban (*Turbo marmoratus*), the largest of the genus, is eaten by the Malays. The shell is of a brownish green with interrupted black bands; when the outer coat is removed the whole presents a beautiful mother-of-pearl appearance, with flickering colours of every hue of the rainbow. It has the largest and heaviest operculum known. These, and others of

a similar kind, are frequently sold by the dealers in shells, minerals, &c., at watering-places as something very wonderful. The purchaser is told that if put into a plate the bottom of which is covered to a slight depth with vinegar, the animal, for such they pretend it to be, will come to life and move about. It is true that such a movement will take place, but it arises from the action of the acid in the vinegar chemically affecting the lime which abounds in the operculum. While mentioning this mouth covering, which so completely fills up the opening of the shell, and protects the animal when retired within it, I must tell you of a still more wonderful contrivance peculiar to a tribe of small shells, some of which we shall find attached to the grass and small plants growing near the shore. It is called a Clausilium, from which the genus takes its name (*Clausilia*), and consists of a small bony plate placed in a groove on the pillar of the shell; it serves the purpose of a door, springing forward and enclosing the animal, and is opened again when necessary by being pushed backward into the groove.

CHAPTER V.

THIS pretty little shell, marked with pink and grey, is the *Trochus Ziziphinus*, the prettiest of the kind which we have on our shores. The genus *Trochus* takes its name from the fancied resemblance of the shells to a top: they have a sharp-pointed spine, and are much admired, not only for their shape, but for their pearly substance, for the elegantly marked ribs, and the varied and beautiful colours with which some are ornamented. The largest of the tribe is *T. imperialis*, but that which is generally most sought after by collectors is a singular one from the east, called the carrier-shell (*T. phorus*), "which," says Mr. Gray, "has the peculiarity of attaching to the outer surface of the shell, as it increases in size, stones, fragments of shells, coral and other marine substances, and are called conchologists or mineralogists, as shell or mineral preponderate. Some of the species have this habit only in an early stage, others retain

it during the whole period of existence; some have the margin of the whorls expanded with a broad disk, others have this part furnished with a

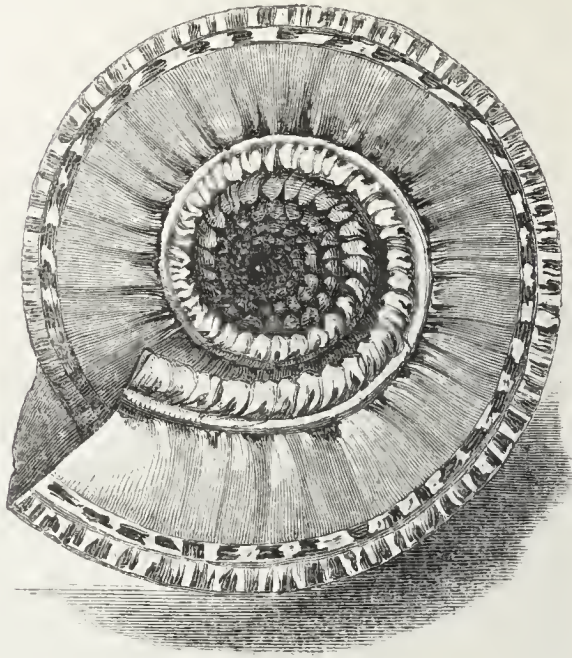


TROCHUS PHORUS.

series of long tubular processes like the rays of the sun; hence the name of Sun-carriers.”

Another pretty foreign shell belonging to this genus is the Staircase Trochus (*Solarium perspectivum*), which presents the appearance of a winding gallery, or well-staircase; when of a

large size it excites great admiration. Though once a dear shell, it may now be purchased at a low rate.



SOLARIUM PERSPECTIVUM.

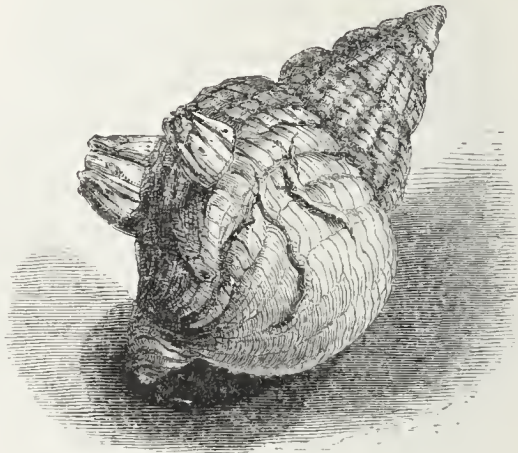
Scalaria pretiosa, Wentle-traps, sometimes called the Royal Staircase, was formerly sold at very high prices; one in France was purchased for a hundred louis, and in England from twenty to thirty pounds has been given for a good specimen. The Empress Catherine of Russia possessed the largest then known. The Chinese, who are ingenious in every

kind of deception, were accustomed to mend broken shells so cleverly that it was difficult to detect where the fracture had been. The shell is now far from rare, and shillings take the place of pounds in the purchase. The women of Amboyna and Batavia are very partial to them, and use them for ear-rings and necklaces.

The two shells which you have brought me, both belong to a class of animals which plunge themselves in sandy mud, and are found in all climates; there is a great variety of them, and some are of considerable beauty. That wedge-shaped one which is open, is a Donax, the animal of which always lies with the short side of the shell uppermost. This shell has been for some time exposed to the heat of the sun, and has lost its colour considerably; when in a nice state it is of a delicate white colour, streaked with pink.

The other, which is closed, you might fancy contained a fish, but none is there, as we well know from that small round hole on the upper valve. To look at it, you would suppose it made by some sharp carpenter's or turner's instrument, so regular is the form, and so smooth the side; the perforator was in all probability one of these

common whelks, whose shells are so plentiful, and of whom this *Tellina* is a favourite food. This genus is easily distinguished by the fold or bending in the margin.



BUCCINUM UNDULATUM.

This Whelk (*Buccinum undulatum*) is the species which is so commonly exposed for sale, and which with *B. Lapillus*, another British species, of which I must make a more lengthened mention, are of those shell-fish which prey upon their kind, and for that purpose are furnished with proboscis armed with a number of minute teeth, enabling them to bore through shells in order to extract the

juices of the animal which they prey upon, as we have seen in the case of the Tellina. *B. Lapillus*, (formerly *Purpura Lapillus*,) is one which secretes a liquor of which the following account is given in the Philosophical Transactions.

“ In the year 1683, Mr. William Cole of Bristol, being at Minehead, was told of a person living at a sea-port in Ireland, who had made considerable gain by marking with a durable and delicate crimson colour, fine linen sent for that purpose to him, and that this colour was made from some liquid substance taken from a shell-fish. Mr. Cole being a lover of Natural History, and having his curiosity thus excited, went in search of these shell-fish, and after trying various kinds without success, he at length found considerable quantities of a species of buccinum on the sea-coasts of Somersetshire, and the opposite sea-coasts of South Wales. After many ineffectual efforts he discovered the colouring matter placed in a white vein lying transversely in a little furrow or cleft, next to the head of the fish, which,” says he, “ must be digged out with the stiff point of a horse-hair pencil, made short and tapering by reason of the viscous clamminess of the white liquor in the

vein, that so by its stiffness, it may drive the matter into the fine linen or white silk intended to be marked. Letters or marks made in this way will presently appear of a pleasant green colour, and if placed in the sun will change into the following colours,—that is, if in winter about noon, if in summer an hour after sunrise, or so much before setting, (for in the heat of the day in summer the colours will come so fast that the succession of each will be scarcely distinguishable); next to the first, light green, will appear a deep green, and in a few minutes this will change to a full sea-green, after which, in a few moments more it will alter into a watchet blue, and from that in a little time more it will be of a purplish red, after which, lying for an hour or two, (supposing the sun still shining,) it will be of a very deep purple-red, beyond which the sun can do no more. But the last and most beautiful colour, after washing in scalding water and soap, will (the matter being again exposed to the sun or the wind to dry) be a much different colour from all those mentioned that is, a fair bright crimson, or near to the prince's colour, which afterwards, notwithstanding there is no styptic to bind the colour, will continue the

same, if well ordered, as I have found in handkerchiefs that have been washed more than forty times, only it will be somewhat allayed from what it was after the first washing.”

In the opinion of Dr. Bancroft, “This dye might still be useful in staining or printing fine muslins, for which purpose but little colouring matter is required. No substance,” he says, “will afford a purple of equal beauty and durability, and capable of being applied to linen, silk, or cotton, with so much simplicity and expedition.” The difficulty of procuring a sufficient quantity of shellfish must render the use of this dye very limited.

This whelk has borne upon its back a little colony of acorn shells (*Balanus*), which appear to have caused it no inconvenience. Some of this tribe grow to a very large size, and have proved a serious impediment to the sailing of the ships on whose sides they had fastened themselves.

To the same family belong the shells of that beautiful genus the Harp, so well-known by the regular longitudinal ribs, suggesting the idea of a stringed instrument. They are found in the seas of warm climates, more especially at the Mauritius, and the neighbouring islands, from which

places are procured the finest of the common species, and the many ribbed, or double Harps, which are accounted the most elegant. The



CASSIS TUBEROSA.

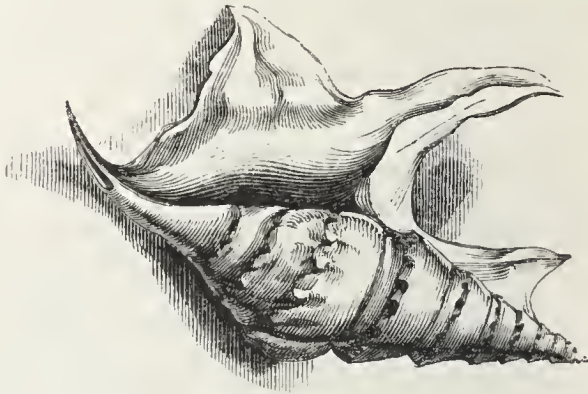
animal is said to be of a rich vermilion red. The fishery is principally carried on at low-water with a small rake, to which a net is attached, on sand-

banks at nights, and at sun-rise, when the harps are probably out on their feed. They have been known to take the bait on the fishing-lines laid for Olives. The shells, when in fine condition, are great favourites with collectors; care should be taken to keep them with their mouths downward, and from the sun and light, or their brilliant colours will fade.

The Helmet Shell (*Cassis tuberosa*), found so abundantly in the West Indian seas, is much employed in the manufacture of shell cameos. The accompanying wood-cut will shew the nature of the process. The subject is worked in relievo in the white portion or outer crust of the shell, while the inner surface, of a pink or reddish-brown tint, is left for the ground.

The Pelican's Foot-strombus (*Strombus pes pelicanus*) near us, of which the Mediterranean specimens are larger, but not more elegant, belongs to a family of which many of the species are very common, and known by the fanciful names of Gouty Scorpions, Spiders, &c., from what we may not very correctly call the spreading arms of the shell. In the West Indies they are found of a very large size full-grown. Some of the genus

produce pearls. Mr. Wood, in his *Zoography*, relates that he saw a pink pearl, which was taken from the body of the animal of *S. gigas*, which is fished for the table off the island of Barbadoes. The



STROMBUS PES PELICANUS.

pearl was discovered by chance while the men were employed in cleaning the fish. Its weight was twenty-four grains, but it would have been more valuable if it had been round. The same author states that only four of these pearls had been discovered in the vast number of shell-fish that are annually brought to market in that part of the world, though he has reason to believe that this in some measure is owing to the carelessness of the negroes, who clean their fish without con-

sideration, and have probably in their hurry returned many a pearl to its native element with the refuse of the animal.

We will this afternoon again scramble upon the rocks; the tide is gradually receding, and I hardly know which is the more pleasing sight, to observe the waves leaving the shore by almost imperceptible degrees, or to watch them as they stealthily encroach on the beach. We may probably find something thrown up, though the weather being calm makes this doubtful; at all events, we shall be at no loss for objects, covered as the rocks are with sea-weed, about which you have much to learn. You must look well to your feet, as our path is a slippery one, and in passing from rock to rock, do not hurry, plant one foot firmly before you move the other, as a fall is far from agreeable.

How pleasing it is to see yonder mass of growing weeds gently raised by the coming wave, swelling under it, floating its fronds for a brief space, and then subsiding into stillness as before.

You would hardly think that the crisp, blackened weed, of which I pointed out to you a few specimens as we were coming down that foot, or rather donkey path, cut by the farmers to enable

them to collect the harvest provided for them on the sea-shore, is the same as this olive-green plant



FUCUS CANALICULATUS.

with the yellow seed receptacles at the end of the frond. With us it varies from three to six inches

in length; I have heard of its being found perfectly formed, with ripened seeds two inches long; and in more northern seas miniature specimens of one inch in length have been gathered. It is the Channelled Fucus (*Fucus canaliculatus*), and springs from a simple stem, but soon begins to shoot into forked branches, which continue to fork till they end in seed receptacles, which are of a conspicuous dull yellow when ripe, not uncommonly cleft also, and wedge-shaped. This plant is well marked by the channel in the centre of the frond continuing throughout its whole length, the margins of which are slightly curved inwards. It is one of those species which grow upon the rocks, and large stones within reach of the flow of every tide, being content with a periodical covering of the waves. Except as manure, and as forming one among the mass employed in the manufacture of kelp, this has as yet no particular use.

The manner in which sea-weeds grow, is to the scientific botanist a matter of great curiosity and interest, but from their place of growth the observation of this is difficult, if not impossible. Mr. Stackhouse, indeed, author of *Nereis Britannica*. in 1796, attempted to grow some Fuci, and has

given us the following account of his experiment. “ Having procured a number of wide-mouthed jars, together with a syphon to draw off the water without shaking or disturbing it, on September 7th, 1796, I placed my plants (*F. serratus*, *canaliculatus*, and *tuberculatus*,) carefully in the jar, with their bases downwards, as in their natural state; on the following morning I decanted off the sea-water, and letting it subside into the basin, I found a few particles at the bottom, which on being viewed with the microscope appeared to be little fragments detached from the surface by friction in carriage; I then poured a quantity of fresh sea-water on the plants and placed them in a window facing the South; on the following morning the jar containing the plants of *F. canaliculatus* discharged into the basin a few yellowish grains, which on examining I found to be the actual seeds of the plant; they were rather oval than pear-shaped, but the most curious circumstance attending the observation was, that each individual seed was not in contact with the water, but enveloped with a bright mucilaginous substance. It was easy to guess the wise economy of nature in this disposition, which, as hinted above, serves a

double purpose, each equally necessary towards continuing the species. On the following morning a greater quantity of seeds was discharged by the plant, and at this time a few seeds were procured from *F. serratus*; but this latter plant discharged such a quantity of mucous fluid that the sea-water in which the plant was immersed was of the consistence of syrup, and consequently the seeds being kept suspended, it was difficult to separate them. The seeds of *F. canaliculatus*, however, were numerous, and visible to the naked eye, and after letting the water rest for a few minutes it was no difficult matter, by gently inclining the basin, to pour off the water and let the seeds remain. In performing this operation I was witness to an explosion or bursting of one of these seeds, which agitated the water considerably under the microscope. Having established this point, viz., that marine plants scatter their seeds in their native element without violence when ripe, and without awaiting the decay of the frond, I next procured some sea-pebbles and small fragments of rock, taken from the beach, and having drained off the greater part of the water in the jar, I poured the remainder on them, and let

them dry for some time, that the seeds might affix themselves. I then fastened strings to the pebbles, and alternately sank them in sea-water in a wide-mouthed jar, and left them exposed to the air, in order to imitate as nearly as possible their peculiar situation between high and low water mark; and when the weather was rainy, I took care to expose them to it. In less than a week a thin membrane was discoverable with the naked eye: on the surface of the pebble where the seeds had lodged this gradually extended itself, and turned to a darkish olive-colour. It continued increasing in size, till at last there appeared numerous buds coming up from the membrane: these buds, when viewed with a glass, were rather hollow in the centre, from which a shoot pushed forth; in some instances they seemed placed on a short thick stalk. These plants continued to put forth these central shoots for some time; but their growth was not rapid after the first efforts, most probably owing to their confined situation: and as I was six or eight miles from the sea, and had not the opportunity of placing the pebbles in some of those pools which are left by the sea at low-water, I discontinued the experiment."

Another species growing close to the last, and in great abundance, is the Saw-leaved Fucus,



FUCUS SERRATUS.

(*Fucus serratus*,) or Prickly Tang, as it is called in the north. The frond is flat and winged, that

is, with a broadish nerve called the mid-rib running through the centre, and varies in length from two to occasionally four feet. I have heard of specimens extending to six feet, but have never seen any so long. Like the Channelled Fucus, it is continually forked in its growth. The surface of it is spotted all over with small but rather prominent holes, from which you may see pencils of very minute white fibres. The seeds, which are brown, surrounded by a transparent white border, are contained in a mass of short, bright, branching, jointed fibres. The leafy part of the frond is frequently worn away, particularly towards the base, by the action of the waves, and the naked mid-rib looks like the stalk of some other species.

In Norway, like many other weeds of a similar kind, it is sprinkled with meal and given as food to cattle. Its chief use with the Dutch and with our own fishermen is to pack lobsters, for which purpose it answers well. In the making of kelp it is not much employed, as it shrinks greatly in drying, and contains but little marine salt. If you look upon the surface of this, you will see three very different productions which have taken

up their abode upon it, and each well deserving notice and examination. Those small, white, curled objects which lie so close to the frond, are the shells or outer coverings of an animal similar to that which we observed upon the whelk, and which under the microscope presents an almost equally curious appearance: it is the *Spirorbis*.

The other attaches itself to shells, stones, wood, bottles, or almost any substance either floating or stationary. This appears to prefer the different kinds of Fuci, few of the larger ones being without it. The other two, belong to that class of the animal world called Zoophytes, so named because, according to some, they partake of the nature both of vegetables and animals, and connect the two kingdoms of organised matter; or because, as others define the term, having the outward semblance of sea-plants, they are yet in reality the formations of little animals or polypes, that nestle in the cells or tubes of the zoophytes, to which they are organically and indissolubly connected.

As you meet with more of these you will be surprised at the graceful arrangement of their forms, some borrowing the character of the

prettiest marine plants, others assuming the semblance of the ostrich plume, while the variety and elegance exhibited in the figures and sculpture of their miniature cups is only limited by the number of the species.

This which spreads irregularly, forming a gauze-like incrustation in several patches, is the *Flustra membranacea*. The cells, which are tolerably distinct even to the naked eye, are oblong, sharp-cornered, with a blunt, hollow spine at each angle. When the inhabitants of these cells, called Polypes, protrude themselves, they form a beautiful object under the microscope, from their numbers, their delicacy, the regularity of their disposition, and the vivacity of their motions, now expanding their tentacula into a beautiful campanulate figure, now contracting their circle, and ever and anon retreating within the shelter of their cells.

The other, Sea-oak Coralline, (*Sertularia pumila*), which frequently covers a considerable space of the weed to which it attaches itself, is of very rapid growth during the summer months, and is produced most copiously. It spreads its numerous but short branches irregularly, and they rarely exceed half an inch in height. It is of a dull horn-

colour. Small as the animal is, it spreads out no less than fourteen feelers, each of which is actively employed in seeking for the minute food required for its existence.

While thus with pleasing wonder you inspect
Treasures the vulgar in their scorn reject,—
See, as they float along, the entangled weeds
Slowly approach, upborne on bladdery beads,—
Wait till they land, and you shall then behold
The fiery sparks those tangled fronds enfold. CRABBE.

There is one property belonging to the more transparent zoophytes which is too curious to be passed over in silence, namely, their highly luminous qualities. If any of these be agitated after being taken from the water, a great number of phosphorescent sparks will be emitted. The Reverend Dr. Landsborough* has given an account of some observations which he made upon several of the species. The Knotted Thread Coraline, (*Laomedea geniculata*,) he says, “was very luminous, every cell for a few moments becoming a star; and as each polype had a will of its own, they lighted and extinguished their little lamps, not simultaneously, but with rapid irregularity, so

* Edinburgh New Philosophical Journal, vol. xxxii. p. 170.

that this running fire had a very lively appearance. More beautiful still," he proceeds, was the *Membranipora stellata* ; for, on its being bent or shaken, every polype in its shell lighted up a very brilliant little star, and for a short time the whole became like an illuminated little city ; while one of the *Flustra*, in consequence of its cells being closely arranged, exhibited when shaken a simultaneous blaze, and became for a little time like a sheet of fire. These were all agitated before the above results were observed ; indeed, the light is emitted only under circumstances that tend to shew that the polypes have felt some painful irritation, which they would drive away by the dread influence of their tiny lamps. Living specimens have been kept for days in sea-water, and observed at all hours ; but no voluntary emission of the flame was detected. It proceeds, no doubt, solely from the polypes themselves, and can only be called forth by irritation ; and when that has ceased, the light declines and dies away.

Fresh water appears to act as a powerful and permanent stimulus on all sea animals which possess this property ; those whose phosphorescence is at irregular intervals immediately emit their light

when brought in contact with it. When placed in a vessel of sea-water and permitted to remain quiet, they afforded no light, and, when touched, gleamed forth only as long as the irritating cause remained, and then gradually returned to their original state. When, however, the same creatures were placed in a vessel of fresh water, they never ceased glowing with their brightest refulgence till life was extinct, which was not until after the lapse of several hours. Others, which were mutilated or so near death as to refuse to emit light upon irritation in sea-water, on being immersed in fresh water produced at least a temporary revival of their brightest gleam.

The luminous appearance of the sea is, we know, caused by the immense number of small phosphorescent animals, some too minute to be evident to the unassisted eye.

“ Spangling the waves with lights, as vain

As pleasures in this vale of pain,

That dazzle as they fade.”

WALTER SCOTT.

Not only do these serve for food to many of the finny tribe, but, among other wise, but to us unknown purposes, may be destined to supply light

to those parts of the ocean which from their distance from the surface can receive no other.

It has been deduced from experiments on the transmission of light through sea-water, that, at the depth of little more than 700 feet, it ceases to be transmitted any longer. Although these experiments may not have produced a strictly accurate result, yet there must at some depth be absolute darkness. Supposing this to be at three times the depth mentioned above, we are still very far from having reached the bottom of the inhabited ocean. Innumerable fishes are known to exist in depths greater than this, and to pass at least a portion of their time in regions to which light never penetrates. In his voyage to the Arctic Sea, Captain Ross brought up shrimps by the sounding apparatus from a depth of 420 fathoms; while many other animals of inferior organisation were found at far greater depths. Here, then, they wander and prey, and here apparently many tribes retire in winter, for reasons which have not been discovered, although the fact is well known to fishermen, who attribute it to the superior warmth of the deeper water. In our own seas, of little depth, many fish

are known to feed only by night. It is not to be supposed that these regions of absolute darkness in the ocean are uninhabited; nor is it possible that those which prey, either in these depths, or during the darkness of the night in our more shallow seas, should be enabled to discover their food without the aid of light, which even in these minor depths must entirely disappear during the night. To supply this want, the property of phosphorescence seems to have been conferred on those animals whose astonishing power of reproduction, and whose insensibility, nearly approaching to vegetable life, seem to mark them as having been principally created for the supply of the more perfect tribes. In these, also, as well as in the larger fishes, the phosphorescent property may serve for enabling them to pursue their own prey, as well as for disclosing themselves to their pursuers. The luminous property of dead fish is, perhaps, calculated for similar wise ends. These, sinking to the bottom of the ocean, become capable of attracting the attention of deep-water fishes; answering the double purpose of food to these tribes and admitting the removal of carcasses which might, produce inconveniences similar to those which

bodies in a state of putrefaction cause on the surface of the earth. It is not improbable that the desire which fishes appear to shew, of following luminous bodies, arises from this natural instinct.

“Meditating upon this subject,” (the luminosity of the ocean,) says Captain Tuckey, “I think it not improbable, that the Deity, who has done nothing in vain, and whose omniscience extends to every epoch, foreseeing that man would invent the means of tempting the trackless ocean, and explore the most distant regions of our planet, has given it as one means of rendering his nights less gloomy, and of diminishing the number of his dangers; especially if we consider that this luminosity is visible only in the night season,—is vivid in proportion to the darkness, disappearing even before the feeble light of the moon,—and also that it increases with the agitation of the sea, so that, during the prevalence of storms, it greatly diminishes the dense gloom which at such times is often impenetrable to the moon and the stars, throws such a light upon the ship and rigging as to enable the sailors to execute their allotted tasks with certainty, and at all times points out to the cautious

mariner the lurking danger of sunken rocks, shoals, and unknown coasts, by the phosphorescent or snowy appearance which it gives to the breakers, so as to render them visible at a considerable distance.”



CHAPTER VI.

THE Saw-leaved Fucus, I observed to you, is of little use in the manufacture of kelp. This, on the contrary, the Sea-oak or Bladder Fucus, (*Fucus vesiculosus*,) is among the best for that purpose, containing a great quantity of marine salt. Like the last mentioned, the frond has a mid-rib, and it is forked in its mode of growth; though most generally flat, it is sometimes found twisted. The air-vessels are sunk in the leaf, round, and mostly in pairs, at irregular intervals, and varying in size from a pea to a hazel-nut: occasionally specimens are met with altogether destitute of them. The inhabitants of Gothland, according to Linnæus, boil it, and, after adding a little coarse flour, give it to their hogs, and consequently know it by the name of Swine-tang; the Scotch call it Sea-wrack, Cheeses are frequently covered with the ashes, and when so dried require no salt.

Sometimes stags have been observed, after a

storm, to descend from the mountains to the seaside, to feed upon this plant, which they relish greatly. When burnt in the open air a black salt powder was the result, to which Dr. Russel gave the name of "vegetable Ethiops:" among other medicinal virtues, it proved a most excellent dentifrice, not only rendering the teeth of a pearly whiteness, but effectually curing the disease incident to the gums.

"The first and most obvious use, however, of sea-weed is for manure, and to this purpose all kinds are applicable. On many of our coasts, as along the west of Ireland, the poorer classes are almost entirely dependent for the cultivation of their potatoes on the manure afforded by their rocky shores and frequent gales of wind. After a storm they may be seen congregating in numbers from the surrounding country, with horses and cars, or with panniers; and the poorest, who cannot afford the assistance of a donkey, are themselves bearers of burdens, eagerly collecting what is thrown up, and carrying it beyond the reach of the tide. These are often carried many miles inland, and, being mixed with sea-sand, form an excellent manure."

As I have frequently mentioned the manufacture of kelp, and the employment of sea-weed for that purpose, it will not be out of place to give you a short account of it, particularly so as it was for some years an important article of domestic commerce. All the larger Fuci were employed, though some, as I have said, are much more productive than others. The crop is gathered in the summer, when most of the weeds have attained their fullest growth: they are dried as rapidly as possible, like hay, collected in heaps, and at the end of the season burnt. This is done by placing them in pits along the sea-shore, when they are set on fire till they are reduced to hard dark-coloured cakes, and in that state sent to market. The crop varies much: in some places the sea-weed is cut only in every third year, while in others, especially where there are strong currents, an annual harvest may be obtained without injury.

The Algæ grow very rapidly, and the produce is far less exposed to casualties than the crops of the agriculturist, especially in so precarious a climate as that of the Hebrides and the Orkney Islands.

During the war, when the price of kelp rose to 18*l.* and 20*l.* per ton, were the palmy days of the

manufacture ; but since the peace, the demand has gradually slackened, and the price fallen away. This result, so unfortunate for the owners of northern estates and the numerous population, is to be attributed at first to the superior qualities of the Spanish barilla for the purposes of glass-making and soap-boiling, but more recently from the removal of the duty from common salt, from the decomposition of which, soda is now so extensively manufactured as to supersede kelp almost entirely for the above purposes.

The manufacture was introduced into Scotland about half a century after its establishment in France and England, and the first cargo was exported from Orkney about the year 1722. The employment, however, being new to the inhabitants of Orkney, the country people opposed it with the utmost vehemence. Their ancestors had never thought of making kelp, and it would appear that they themselves had no wish to render their posterity wiser in this matter. So violent and unanimous was the resistance, that officers of justice were found necessary to protect the individuals employed in the work. Several trials were the consequence of these outrages. It was gravely

pleaded in a court of law, on the part of the defendants, "that the suffocating smoke that issued from the kelp-kilns would sicken or kill every species of fish on the coast, or drive them into the ocean far beyond the reach of the fishermen, blast the corn and grass on their farms, introduce diseases of various kinds, and smite with barrenness their sheep, horses, and cattle, and even their own families." The proceedings still exist in the records of the sheriffs' court,—a striking instance of the prejudices, indolence, and superstition of the simple people of Orkney in those days. The influential individuals who had taken up the matter succeeded in establishing the manufacture; and the benefit which accrued to the community soon wrought a change in the public feeling. The value of estates possessing a sea-coast well stocked with sea-weed, rose so much in value, that, where the plants did not grow naturally, attempts were made, and not without success, to cultivate them, by covering the sandy bays with large stones. By this means a crop of Fuci was obtained in about three years, the sea appearing to abound everywhere with the necessary seeds.

Upon the authority of Dr. Barry, during the years 1790 to 1800, the quantity sometimes made was 3000 tons; and, as the price was then from 9*l.* to 10*l.* per ton, the manufacture brought into the place nearly 30,000*l.* sterling sometimes in one season.

The inhabitants of Canna, says Dr. E. D. Clark, (1797,) like those of the neighbouring islands, are chiefly occupied in the manufacture of kelp. Cattle and kelp constitute, in fact, the chief objects of commerce in the Hebrides. The first toast usually given on all festive occasions is, "A high price to kelp and cattle!" In this every islander is interested, and it is always drunk with evident symptoms of sincerity.

You call my attention to that small shell which is moving so fast on the little ledge by the side of the rock, and express your surprise that the fish should be enabled to crawl so quickly. It is no fish, no natural inhabitant of the shell, which has such powers of motion. I will catch it; and when you see what is contained in this moving house, your wonder at its speed will cease. Here it is, but so closely has the animal retired, and so carefully has it covered the mouth of the shell with

part of its own body, that you will not be able even now to discover what it is. You cannot, however, avoid admiring the skill with which the little inhabitant has protected itself, and how impossible it is for any enemy to get at him, unless capable of



THE SOLDIER CRAB.

crushing house and all. It is the Hermit, or Soldier Crab, (*Pagurus bernhardus*,) so called because

the shell which serves it for a dwelling has been likened to the cell of a hermit. It differs from all other kinds of crab in having the tail destitute of the protection of a shell, and therefore requires some external covering to prevent it from meeting with the numerous injuries to which it would be otherwise exposed. To supply this necessary want, an instinct has been bestowed upon the animal by which it seeks some empty spiral shell capable of affording the protection which it needs. Into this, when found, it carefully backs itself; and the end of the tail being furnished with something resembling hooks, it affixes itself by these to the top of the spire. Some authors have asserted that the Hermit puts to death the natural proprietor of the shell in which it is desirous of establishing itself; but this is a calumny it does not deserve, as an empty shell is always the object of its search. When the body grows too large for its first habitation, which it usually does in the course of a year, the animal is obliged to seek for another of a larger size. One who was fortunately a witness to this change of lodging has thus described it:—
“The Soldier, when about to seek a new habitation, is still seen in its old shell, which it appears

to have considerably outgrown ; for a part of the naked body is seen at the mouth of it, which the habitation is now too small to hide. A shell, therefore, is to be found large enough to cover the whole body, and yet not so large as to be unmanageable or unwieldy. To answer both these ends is no easy matter, nor the attainment of a slight inquiry. The little Soldier is seen busily parading the shore along the line of pebbles and shells which is formed by the extremest wave ; still, however, dragging its old incommodious habitation at its tail, unwilling to part with one shell, even though a troublesome appendage, till it can find another more convenient. It is seen stopping at one shell, turning it, and passing it by ; going on to another, contemplating that for a while, and then slipping its tail from its old habitation, to try on a new. This also is found to be inconvenient, and it quickly returns to its old shell again. In this manner it frequently changes, till at last it finds one light, roomy, and commodious ; to this it adheres, though the shell be sometimes so large as to hide the body of the animal, claws and all."

Sometimes, two will contend for the possession of the same shell, on which occasion they fight

with great obstinacy; it is from these combats that it has acquired the name of Soldier. When threatened with any danger, it retires as far as possible into the interior of its dwelling, wraps one claw upon the head and the other upon that, and thus presents a strong barrier against all outward violence; and it does not shew itself again till long after the peril has ceased. When seized, it is said to utter a feeble cry, and endeavour to fasten upon the enemy with its nippers; and if it should succeed in doing so, will rarely quit its grasp till killed.

On our shores the Hermit is found in a great variety of shells, the largest occupies the Whelk, our largest univalve.

The Soldier Crabs, unarm'd by nature, left
Helpless and weak, grow strong by harmless theft;
Fearful they crawl, and look, with panting wish,
For the cast crust of some new cover'd fish,
Or such as empty lie and deck the shore,
Whose first and rightful owners are no more.
They make glad seizure of the vacant room,
And count the borrow'd shell their native home;
Screw their soft limbs to fit the winding case,
And boldly herd with the crustaceous race.
But when they larger grow they fill the place,
And find themselves hard-pinch'd in scanty space;

Compell'd they quit the roof they loved before,
 And busy search around the pebbly shore,
 Till a commodious roomy seat be found,
 Such as the larger shell-fish living own'd.
 Oft cruel wars contending Soldiers wage,
 And long for the disputed shell engage :
 The strongest here the doubtful prize possess,—
 Power gives the right, and all the claim confess.

There are also Hermit Land-Crabs. Nicholson, in his *Natural History of St. Domingo*, describes a species which inhabits the dry places of the sea-shore and of the hills; which, when plunged into the sea, and even into fresh water, uses every effort to get out, perishes there in a short time, and which inhabits univalve land-shells. Mangé, who visited some of the Antilles, informed M. Latreille that he found land *Paguri* escape him at the moment he was about to seize them, by rolling with their shells from the top of the rocks, or off elevated places, to the bottom.

Mr. Gosse* mentions a genus allied to these, (*Birgus*,) not inhabiting shells, which is remarkable for its very singular peculiarity of climbing trees. “ It is found in the Pacific Islands, where in the

* Introduction to Zoology, vol. ii. p. 285.

night-time it ascends the palm-trees to devour the cocoa-nuts. The species alluded to (*B. latro*) is of gigantic size, and of such strength, that, if the animal has seized a stick in its claws, a child may suspend itself from the end without causing it to relinquish its hold.”



CHAPTER VII.

THE plant growing in this pool is *Chondrus crispus*, which, you know, under the name of Irish Moss or Carrageen. It was a few years ago in much request, and the collecting and preparing it for market afforded a small revenue to the industrious peasantry of the west coast of Ireland, where these plants grow in great profusion. The price at one time was as high as 2s. 6d. per pound, but the demand has latterly diminished, and the price of course fallen considerably. The frond was boiled down, strained, and used as a substitute for isinglass, in the manufacture of blancmanges and jellies, and was at one time a fashionable remedy in consumptive cases. As the demand slackened for these purposes, it was tried as a size, and has been shipped to England for the use of the calico-printers, but was not found to answer well for their purposes.

When reduced by boiling, to a kind of glue, it has been employed by Mr. Dawson Turner to fix

those sea-weeds on paper which do not themselves possess a sufficiently adhesive quality. For this



CARRAGEEN MOSS.

purpose it is admirably calculated, as it imparts no stain, like glue, or glaze, like gum ; nor is anything

farther necessary than to rub over with it the paper on which the specimens are to be preserved, and the delicate membranous species will, by pressure, be fixed so firmly as to be afterwards inseparable.

An East Indian species, known by the name of Ceylon Moss, is much used in the East as a nutritive article of food, and for giving consistence to other dishes. It is of a very gelatinous nature, and when boiled down is almost wholly convertible into jelly. Large quantities are annually sold. Allied to this, is no doubt that species which enters so largely into the composition of the celebrated edible nests of China.

The bird which makes these nests is as black as jet, says Captain Forrest, and very much like a martin, but considerably smaller. Its nests are found in caves, and generally in those to which the sea has access. They are made of a slimy gelatinous substance found on the shore, of the seaweed called *agal-agal*, and of a soft greenish sizzly matter often seen on rocks in the shade, when the water oozes from above.

In shape the nest is like that of an ordinary swallow; and in external appearance, as well as

consistence, somewhat resembles a fibrous, ill-cooked isinglass. The nests are collected by the natives twice a year; and, if this be regularly done, and no unusual injury be offered to the caverns, the supply remains tolerably equable, very little increase of quantity being found to result from leaving the caves unmolested for a year or two. Most of the caves are so situated as to render the task of collecting the nests very difficult, and requiring all the skill of persons trained for that purpose. In some places the caves are only to be approached by a perpendicular descent of many hundred feet, by ladders of bamboo and rattan, over a sea rolling violently against the rocks. When the mouth of the cavern is attained, the perilous office of taking the nests must often be performed by torch-light, by penetrating into recesses in the rock, where the slightest trip would be fatal to the adventurers, who see nothing below them but the turbulent surf making its way into the chasms of the rock. The value of these nests depends upon various circumstances: the best are obtained in deep damp caves, and are taken before the birds have laid their eggs; whereas the coarsest are those which have been taken after the birds are

fledged. The only preparation which they undergo is that of simply drying, without direct exposure to the sun. They are assorted for the Chinese market into three kinds, according to their qualities. The price obtained at Canton, for the best, is nearly 6*l.* sterling per pound ; for the second, upwards of 4*l.* ; and for the worst, not quite 3*l.* They are again sorted, and the best fetch a price more than equivalent to their weight in silver ! The most singular circumstance connected with this subject is, that the Chinese appear to be the only purchasers, they being the only people who have persuaded themselves to deem these nests a luxury. The best are consumed only by the great, and chiefly by the Emperor and his court. The mode in which the best are used is said to be as follows:—The nests are first soaked in water to soften, and then pulled to pieces, and, after being mixed with ginseng,* are put into the body of a fowl. The whole is then stewed with a

* A root found in China, to which extraordinary properties have been ascribed. The weight in gold has been given by the Chinese for this root, which we are told grows only in the most remote and inaccessible parts of Chinese Tartary, where its collection is attended by dangers sufficient to appal the stoutest man.

sufficient quantity of water over a fire, where it remains all night, and in the morning the fowl is ready to be eaten. In other cases the nest is used as a seasoning for soups, or made up like our jellies.

The sea-weed, however, which is of the greatest real use in China is the *Fucus tenax*, which is gathered in great abundance. It is found in almost every part, but is principally collected in the provinces of Fokien and Tche-kieng. The quantity annually imported at Canton is about 27,000 lb., and it is sold in that city at sixpence or eightpence per pound. In preparing it, nothing more is done than simply drying it in the sun. The Chinese, when they have occasion to use it, merely wash off the saline particles and other impurities, and then steep it in warm water, in which, in a short time, it entirely dissolves, stiffening as it cools into a perfect gelatine, which, like glue, again liquefies on exposure to heat, and makes an extremely powerful cement. It is employed among them for all those purposes to which gum or glue are here deemed applicable, but chiefly in the manufacture of lanthorns and transparencies, for which the Chinese are celebrated, and sometimes it is used

to thicken or give a gloss to gauze or silks. Mr. Neill supposes that it forms a principal ingredient in the gummy matter, *chin-chou* or *hai-tsai*, of China and Japan, with which windows, formed simply of slips of bamboo crossed diagonally, have their lozenge-shaped interstices wholly filled up.

If I had a stick with me I should try whether I could succeed in catching that Crab which is walking at the bottom of the pool, in the way they catch them in some parts of Scotland. They adopt this plan: two men go out in a boat, when the weather is calm and the water clear, and watch the Crabs as they walk on the sand at the bottom. They then gently put down a pole behind the Crab and touch it: the animal immediately turns round and seizes the offending stick. The fisherman shakes the pole gently, and the angry crab bites still harder, and retains his hold till he is lifted up into the boat. It is not an unusual plan, where they are plentiful, to let down a bunch of offal into the water in order to capture them: they seize fast hold of this, and suffer themselves to be pulled up, though they not unfrequently loose their hold as soon as they are out of the water. The most

efficacious way of taking them is by wicker pots or creels, which are sunk mouth upward, and with a piece of fish, generally tainted, at the bottom. These creels are so constructed, that, though the animal can readily get at the dainty which tempts him, he finds it impossible to make his escape, and there remains, with the lobsters and prawns who follow his example, till the fisherman comes to learn the result of his stratagem. I have mentioned the extraordinary tenacity with which crabs will cling to any object they seize upon, but it is not often the cause of such a melancholy and fatal accident as occurred a few years since on the coast of Cornwall.

A man was found dead on the lower rocks of a steep cliff, from which the tide had just retreated. On attempting to remove the body, it was discovered that one of the hands was in a fissure of the rock, where it was firmly clutched in the claw of an enormous crab. It was supposed that the unfortunate man had suffered a lingering death by drowning; that, having been overtaken by the tide, he had attempted to climb the steep cliff, and thrusting his hand into the hole to support himself, had thus fallen a victim to the deadly grasp of

its shelly inhabitant. The people who found the body were obliged to destroy the animal, by thrusting in an iron bar, before they could release the unhappy victim.

This we have been looking at is a small specimen of the Common Crab (*Cancer Pagurus*), so well known and so easily distinguished from the rest by the scalloped margin of its shell, and the large smooth claws with black fingers. The size to which it grows, and the excellence of its flavour, occasion it to be more sought after than any other of the species. "It inhabits the whole of our coasts, preferring those parts which are rocky; and its usual retreats are amongst holes in the rocks, where it generally retires when not engaged in seeking its food. It is often seen in such situations, even when the tide has rendered the rocks accessible, as, for instance, among those on the shore at Hastings, where I have often seen them in the pools and caverns left by the receding tide. These, however, are always small individuals, rarely more than three inches in breadth; the larger ones remain farther at sea, amongst the rocks in deep water; and they also bury themselves in the sand, but always in the immediate

neighbourhood of the rock.”* The peculiar mode of walking or running in the Crab tribe has always been a matter of amusement and surprise. Those which run best, employ the eight hind feet alone, which are all terminated by strong and pointed claws. They walk with the same facility forward and backward, on one side or the other, or in all oblique directions possible: they are seen to climb very inclined planes, and even a perpendicular surface, with the greatest celerity, provided that these planes be not altogether smooth.

Till within these few years it was a matter of very great doubt what form the young of the Crab assumed; “But,” says Mr. Bell, in the work above quoted, “it was in the month of June, 1826, that Mr. J. V. Thompson had the good fortune to succeed in hatching the ova of the Common Crab, and thus by perfect and satisfactory observation demonstrated the theory of the true metamorphoses of the crustacea; a discovery which may rank amongst the most interesting and important that have been made within the sphere of the sciences of observation, not only in the present, but in any previous age.” This change of form, however,

* Bell's British Crustacea, p. 61.

does not appear to be the case with the whole Crab tribe, as in the British Museum there is the



GRAPSUS VARIUS.

tail of a Crab, (*Grapsus varius*,) a native of the Mediterranean, which contains the young perfectly formed. This also is the case with the lobster. When the young first emerge from the egg they are transparent and extremely soft, but in all

other respects similar to the old ones. As their delicacy would expose them the first days after their birth to dangers without number, their Creator has provided for them, for some time, a retreat under the tail of the mother. When the mother is quiet in the water, these little shell-fish may be seen coming out from between her legs, and venturing to creep around her, and then, in the moment of danger, withdrawing altogether into their asylum. It appears that the mother warns them of what they ought to fear, for it is never without a motive that they fly in this manner. They nevertheless abandon their mother by little and little as they

increase in size; and they are seen but rarely with her towards the end of the first fifteen days after their birth. Both lobsters and Crabs live only upon animal substances; everything in the animal way is to their taste, whether living or in a state of corruption. In case of famine, and especially when they change skin, they will eat one another. Small fish, small mollusca, the larvæ of insects, and everything that is drowned in the waters, form the basis of their subsistence in the summer season. They remain during the entire winter almost without eating anything. There is a curious specimen of a white lobster in the British Museum which was caught off the coast of Norway, and when living was of a red colour: this difference no doubt arose from some disease of the animal, similar to that which causes the albino in the human race.

The most curious circumstance, however, connected with the history of these animals is the changing of their shell, which up to a certain age takes place every year. This power is providentially bestowed upon them to enable them to increase in size, which would otherwise be impossible, from the solid and unyielding nature of their

covering. The crab, in order to prepare for the great change it is about to undergo in shifting its shell, chooses a close and well secured retreat in the cavities of rocks or under great stones, where it creeps in and remains during the operation, so as to be free from interruption and danger during its helpless state. For some days before this change the usual voraciousness of the animal ceases, and it remains without eating; no longer turning up the sand at the bottom, or fighting with others of its kind, or hunting its prey, but remaining torpid and motionless. It becomes thin, and in the meantime a new skin, the future shell, but yet soft and expansible, is formed between the old shell and the body. Just before casting its shell, it throws itself upon its back, and strikes its claws against each other; it then swells itself in an unusual manner, the shell is seen beginning to divide, and the shield of the chest and head is thrown off as a single piece. The claws are now to be withdrawn; these burst at the joints, and the animal casts them off as we should do a boot that was too large for us. Every part of the shell of the animal is renewed, and in that which it lost nothing is wanting: not only the larger parts,

but the antennæ, the jaws, the eyes are there ; every hair is a case which encloses another hair.* Thus, in a short time, this wonderful creature finds itself at liberty, but in a state of extreme weakness and exhaustion, remaining some hours motionless. Indeed, so violent and painful is the operation, that to many it proves fatal, and even those who survive are unable to take food or remove from their retreats. The limbs are so soft that they may be bent like wet paper, and everything which attacks it becomes an irresistible enemy. The animal suddenly increases in bulk ; the new skin hardens rapidly, a stock of shelly matter having been for some time accumulating in each side of its stomach in the form of two hard balls, usually called Crab's eyes. This substance is now taken up and distributed to the surface, so that, when this new crust has obtained hardness, the balls are no longer found. At some period of the Crab's life this change ceases, as we may see from specimens in the British Museum, one of which has oysters on it several years old. This oyster is supposed by Turton to be of a different species from the

* Gosse, Introduction to Zoology.

common edible one, and from its habit he calls it the Parasitic Oyster (*Ostrea parasitica*).



CRAB WITH OYSTERS.

The Land Crabs, of which, however, we have none in England, are too curious in their habits not to be mentioned ; they abound in the eastern part of Jamaica, and are most plentiful in May, the season at which they deposit their

eggs, or *run*, as the negroes express it, when the earth is literally covered with them. At this season it is impossible to keep them out of the houses, or even out of the bed-rooms, where, at one time scratching with their large claws, and at another rattling across the floor, they make a noise that would not a little alarm a stranger. Occasionally they will lodge themselves very snugly in a boot; and if a person puts his feet upon them inadvertently, he has quick intimation of the intruder by a grasp of his nippers. For a few weeks in this season they may be gathered in any quantities, and the negroes sometimes hurt themselves by making too free use of them. Even the hogs catch them, though not with impunity, as a Crab sometimes gets hold of one by the snout, from which he is not easily disengaged, and the terrified animal runs about squeaking in great distress. At other seasons, and when more valuable, they are caught by torchlight, and put into covered baskets. Crowds of negroes go every evening with their torches and baskets to the crab woods, and return before midnight fully laden. Their baskets will contain about forty Crabs, and the regular price is a five-penny piece (the

smallest coin, equal to about threepence-halfpenny of our money) for five or six Crabs. At this rate a negro will make half-a-crown of our currency in an evening; and the more improvident, who will not cultivate provision-grounds, depend in some measure upon catching Crabs, and selling them to the others. A hundred plantains or yams, usually sold at 5s., will purchase from sixty to seventy Crabs, and two of these eaten with yams make an excellent meal. Almost every negro family has an old flour-barrel pierced with holes, in which their Crabs are kept. They are fed on yam skins, &c., and taken out and thrown into the barrel as wanted. There is a great variety of Crabs in Jamaica, of which two only are eaten. The black is the finest, and is esteemed as great a delicacy as turtle. These live in the mountain forests, and feed on the fallen and dry leaves of the trees. The Crabs used by the negroes are purplish white: these are amphibious. In some of the low-lying estates they commit considerable damage, by nipping off the blade of the young canes and corn, as it shoots through the ground. In situations of this kind the negroes have a somewhat singular mode of

catching them. They know from the appearance of a crab-hole if there be a Crab in it, and dig down with a hoe through the soft loam, till they come to water, (about eighteen inches or two feet,) and then close the hole firmly with a handful of dry grass. In this manner a negro will shut up two or three dozen holes in a morning. About four hours after he returns, and his prisoners being by this time half-drowned, they tumble out with the plugs of grass, and are caught. In the year 1811 there was a very extraordinary production of Black Crabs in Jamaica. In the month of July the whole district of Manchioneal was covered with countless millions; the roads in some parts appeared of a reddish colour, as if strewed with brick-dust; this was owing to the myriads of young Black Crabs, about the size of the nail of a man's finger, which crossed there, moving at a pretty good pace direct for the chain of Blue Mountains, which, extending from west to east through the centre of the island, terminates on the sea-coast. How they had been produced, and where they came from, were questions that everybody asked and none could answer. No unusual number of old Crabs had been observed that season, and it is

worthy of remark that these millions of young ones were moving from a rock-bound shore, formed by inaccessible cliffs, the abode of sea-birds, and against which the waves of the sea are constantly dashed by the trade wind blowing directly upon them. That the old Crabs should be able to deposit their eggs in such a part of the coast (if that, as would appear, is the habit of the animal) is not a little extraordinary. Since this time Black Crabs have been abundant farther into the interior of the island than they were ever known before.*

We will now return homewards.

For in the deep the sun his glory hides,
A streak of gold the sea and land divides ;
The purple clouds their amber linings show,
And edged with flame rolls every wave below.

* Barclay's View of Slavery in the West Indies.

CHAPTER VIII.

Each creek and bay
 With fry innumerable swarms ; and shoals
 Of fish, that with their fins and shiny scales
 Glide under the green wave. MILTON.

WATCH the shoal of small fish which has been left in this pool by the tide, and observe the elegance as well as the rapidity of their movements, circling their present confined home so incessantly. As they turn, and the under part is seen for a moment, it looks like a flash of light. If we were to continue here till the tide came and set them free, we should find them always occupied in the same manner. They are the Montagu's Blenny (*Blennius Montagui*). There is no sea weed in this hollow of the rock, nor any crevices, or they would quickly retire from observation, and remain concealed till they are restored to the world of waters. The colour above is a bright olive-green spotted with pale blue shaded to white ;

the belly white, and the pectoral fins tipped with orange. So vigilant and so active are they, that we should scarcely succeed in catching one even with a small landing-net. Many of the fish, which, from feeding on small crustacea near the edge of the tide, are apt to be left by it, either in shallow pools or on the sand, have the power of living for a long time out of water, particularly when they can hide themselves under sea-weed or a large stone, or partially bury themselves in the wet sand. This is the case with the Father-Lasher (*Cottus bubalis*), or Long-spined Cottus. It is easily recognized from its well-armed head and long spines. Although its colours are bright, the general appearance of the fish is forbidding; yet in Greenland, where it attains a larger size, it is in such great request, that Pallas tells us it forms the principal food of the natives, and the soup made from it is said to be both agreeable and wholesome. Its spawn is very large and of a fine orange-colour.

The habits of the rough-tailed three-spined Stickle-back (*Gasterosteus trachurus*), one of the smallest as well as one of the most common of our fishes, are worth mentioning; they are as active as the Blenny in their movements, and are extremely

pugnacious. If a few are confined in a wooden vessel, they will immediately choose certain positions, for which they fight with each other furiously. Two combatants will swim round and round, biting, and endeavouring to pierce each other with their stiff spines, which they project for the purpose, sometimes with such fatal effect as to rip each other up, and sink dead to the bottom of the vessel. These are the habits of the males alone; the females are quite peaceful, and unmolested by the male: they are not of so brilliant a colour.

These fish are occasionally so numerous at Spalding, in Lincolnshire, that a man employed by a farmer to take them has earned four shillings a day for a considerable time, by selling them at a halfpenny a bushel. Attempts have been made to obtain oil from them; but they are more frequently spread over the land for the purpose of manure.

Fish have frequently been supposed by naturalists to be of all the larger animal world the least possessed of sensibility, to be incapable of powerful impressions, and to be gifted with very little of that species of intellectual power which is shared

by so many of God's creatures. Such an opinion, however, we may unhesitatingly pronounce to be erroneous, founded on man's ignorance, rather than from any accurate acquaintance with the nature and habits of the creatures, of which, from the very place of their abode, we can know but very little. It would be impious to doubt of their having such a proportion of instinct as is necessary for the rank which they hold in the vast scale of creation, suited to their wants and adapted to their necessities.

Cuvier speaks of fish in rather too disparaging a style. "Breathing," he says, "only through the medium of water, their blood is necessarily cold, and their vitality, the energy of their senses and movements, are consequently less than in mammalia and birds. Their brain, therefore, or rather a composition similar to it, is proportionably much smaller, and the external organs of their senses are not of a nature to admit of powerful impressions. Fishes, in fact, are, of all vertebrated animals, those which have the least apparent signs of sensibility. Having no elastic air at their disposal, they remain mute, or nearly so, and all those sensations awakened or sustained by the voice remain

unknown to them. Their eyes almost immoveable, their bony and rigid countenance, their limbs deprived of the power of inflexion, and every part moving at the same time, deprive them of the faculty of varying their physiognomy or expressing their emotions. Their ear, enclosed on every side by the bones of the skull, and by its peculiar conformation, scarcely allows them to distinguish the most striking sounds ; and, in fact, an exquisite sense of hearing would be of very little use to those destined to live in the empire of silence, and around whom all are mute. Their sight in the depths of their abode would be little exercised, if the greater part of the species had not, by the size of their eyes, been enabled to supply the deficiency of light ; but even in these species the eye scarcely changes its direction ; still less can it change its dimensions, and accommodate itself to the distance of objects : its *iris* neither dilates nor contracts, and its *pupil* remains the same in every degree of light. No tear bathes its eye, no eyelid soothes and protects it ; and in this class it must be regarded as only a feeble representation of that beautiful, brilliant, and animated organ of the higher classes of animals.

Procuring food by swimming after a prey which itself swims with greater or less rapidity, having no means of seizing this prey but by swallowing it, a delicate sense of taste would have been useless to fishes. Lastly, we come to the touch, which, on account of their bodies being encircled with scales, by the inflexibility of the rays of their limbs, and by the dryness of the membranes enveloping them, has been obliged, as it were, to seek refuge at the end of their lips; and even these in some species are reduced to a dry and insensible hardness."

This account savours more of the unbridled fancy of Buffon, than it does of the reasoning and observation of the scientific naturalist. No tear, indeed, may bathe the eye, but we are not on that account to imagine that they are altogether destitute of affection. This has been observed even in the well-known Gold and Silver Fish, the pets of the drawingroom, the only domesticated fish, but the habits of which have not been sufficiently well observed. Mr. Jesse, in his *Gleanings in Natural History*, mentions that "a person, who kept two together in a glass, gave one of them away: the other refused to eat,

and shewed evident symptoms of unhappiness, till his companion was restored to him.”

The Sun-Perch (*Labrus auratus*), of the North American rivers, so called from its delight in clear and shallow waters, where it can be exposed to the sun's influence, is chiefly remarkable for its parental assiduity in forming and watching a nest. “The Sun-Perch,” says that most enthusiastic naturalist and engaging writer, Audubon, “wherever found, seems to give a decided preference to sandy, gravelly, or rocky beds of streams, avoiding those of which the bottom is muddy. At the period of depositing their eggs this preference is still more apparent. The little creature is then seen swimming over shallows, the bed of which is mostly formed of fine gravel: after a while it is observed to poise itself, and gradually sink to the bottom; where, with its fins, it pushes aside the sand to the extent of eight or ten inches, thus forming a circular cavity. In a few days a little ridge is thus raised around, and in the cleared area the roe is deposited. By wading carefully over the extent of the place, a person may count forty, fifty, or even more of these beds, some within a few feet of each other, and some several yards apart. Instead of aban-

doning its spawn, as others of the family are wont to do, this little fish keeps guard over it with all the care of a sitting bird. You observe it poised over the bed, watching the objects around. Should the decayed leaf of a tree, a piece of wood, or any other substance happen to be rolled over the border of the bed, the Sun-Perch carefully removes it, holding the obnoxious matter in its mouth, and dropping it over the margin. Having many times witnessed this act of prudence and cleanliness in the little Sunny, and observed that at this period it will not seize on any kind of bait, I took it into my head one fair afternoon to make a few experiments for the purpose of judging how far its instinct or reason might induce it to act when disturbed or harassed.

“ Provided with a fine fishing-line, and such insects as I knew were relished by this fish, I reached a bar, covered by about one foot of water, where I had previously seen many deposits. Approaching the nearest to the shore with great care, I baited my hook with a living ground-worm, the greater part of which was left at liberty to writhe as it pleased, and throwing the line up the stream, managed it so that at last it passed over the border

of the nest, where I allowed it to remain on the bottom.

“ The fish, I perceived, had marked me ; and as the worm intruded on his premises, he swam to the further side, there poised himself for a few moments, then approached the worm, and carried it in his mouth over the next side to me, with a care and gentleness so very remarkable, as to afford me much surprise. I repeated the experiment six or seven times, and always with the same result. Then, changing the bait, I employed a young grasshopper, which I floated into the egg-bed. The insect was removed as the worm had been, and two attempts to hook the fish were unsuccessful. I now threw my line with the hook bare, and managed as before. The Sunny appeared quite alarmed. It swam to one side, then to the other, in rapid succession, and seemed to entertain a fear that the removal of the suspicious object might prove extremely dangerous to it. Yet it gradually approached the hook, took it delicately up, and the next instant dropped it over the edge of the bed.”

Some few species shew also an attachment to their young, and even watch and defend their own spawn. Pennant says of the River Bull-

head, "it deposits its spawn in a hole it forms in the gravel, and quits it with great reluctance." I have been also favoured by an excellent observer with the following notice on the same fish:—"It evinces a sort of parental affection for its ova, as a bird for its nest, returning quickly to the spot, and being unwilling to quit it when disturbed." It is believed also of the Lump Sucker, that the male fish keeps watch over the deposited ova, and guards it from every foe with the utmost courage. If driven from the spot by man, he does not go far, but is continually looking back, and in a short time returns.

The organs of hearing in fish, though they may not be so acute as those possessed by animals who breathe the air, yet are not altogether so dull as many imagine. The Chinese, who breed large quantities of the well-known Gold Fish, call them with a whistle to receive their food. The domestication of these animals forms a great portion of the amusement of the females in China. Their habits being sedentary and their resources few, a great degree of perfection has been attained in the art of taming. The fish have been taught to distinguish a peculiar sound made by those from whom they receive their

food ; they come at their call ; they feed from their hands, and suffer themselves to be freely examined by individuals with whom (if we may use the term) they are acquainted, and are said even to recognise their footsteps at a distance. This is indeed a curious example of the power of art and perseverance over the habits of creatures, who, protected by the element in which they are placed, are naturally independent of the protection of man.

Sir Joseph Banks used to collect his fish by sounding a bell ; and Carew, the historian of Cornwall, brought his Grey Mullet together by making a noise with two sticks.

The olfactory nerves in fishes are of very large size, and the extent of surface over which the filaments are disposed is very considerable. The nostrils are generally double on each side, but both openings lead to one common canal. Their sense of smell may be presumed to be acute, from the selection they are known to make in their search after food, and the advantage said to be gained by the use of various scented oils, with which some anglers impregnate their baits. A Pike, in clear water, has been seen to approach and afterwards turn away from a stale Gudgeon, as if perfectly

aware at that distance of the real condition of the intended prey.

The eye of fish is not perfectly immoveable, for those who watch Gold and Silver fish will observe that they turn them backward and forward, in a slight degree, as occasion may require. White, in his *History of Selborne*, says, that a lighted candle, placed close to the glass in which some were confined, had no effect upon them; this is no doubt true, because, as Cuvier tells us, the pupil of the eye of fish remains the same in every degree of light. But it does not follow on that account that it was insensible to it; no fact is better known than that fish are powerfully attracted by luminous objects. The Chinese are said to use lanthorns in their fishing, in order to draw the fish to the surface; and those engaged in Salmon fishing place great reliance on the effect of the torches they carry during their night expeditions.

They must be able to measure distances with some considerable degree of accuracy, or they would not partially leap out of the water, and catch with unerring aim the fly which is hovering over them, or seize with such alacrity the piece of bread which is thrown to them.

When water is clear, smooth, and undisturbed, the sight of fish is very acute: this is well known to anglers, who prefer a breeze that ruffles the surface, being aware that they can then approach much nearer the objects of their pursuit, and carry on their various deceptions with a much better chance of success.

From the nature of the eye it is impossible to judge whether a fish is asleep or not, as it is always open; but Gold and Silver fish are to be seen motionless, and Trout are frequently in the same state on the surface of the water. Mr. Gosse, indeed, says, "Seriously, I have often doubted whether any cold-blooded animals sleep; or, at least, whether they are not able to do without it for long-continued periods at will. I have known fishes, very remarkable, and easily recognisable, keep under the stern of a vessel and about her rudder for many days together, while sailing through the ocean: if they had slept during that time, of course the vessel would have left them; and, besides, as there is no shelter in the ocean, without going down to unfathomable depths, I think, if the smaller fish were to sleep, all exposed as they must be, they would inevitably fall an unresisting prey to those ra-

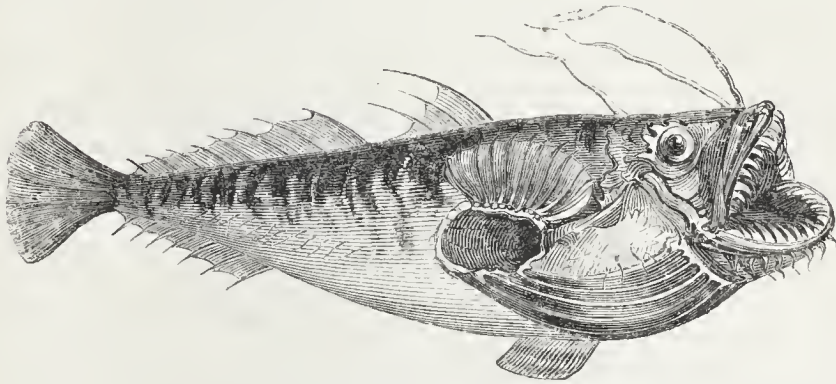
venous tribes which continually watch to devour them.”

Carp in England are said to bury themselves in the mud during the winter ; but no fish, perhaps, is so singular in its hybernation as the Sleeping Fish of the river Gambia (*Lepidosirin annectans*), which sleeps nine months out of the twelve. It propagates in August and September, feeds principally on vegetables until the end of November, then, according as the rains are early or late, while the ground is soft, it makes a hole about a foot below the surface, and there continues until the following July. Specimens of this curious animal were sent to the Bristol Institution by James Warren Bunter, Esq., in 1843. They were in a torpid state, but revived after being taken from the pieces of hardened earth in which they had been imbedded for nine months, and soaked in tepid water.

Some fish emit sounds, as the Cuckoo Gurnard (*Trigla Cuculus*), so called from the peculiar cry which it makes when taken out of the water, and which much resembles the note of the well-known bird. There is also another of the same family (*Trigla gurnardus*), which, in the north of England, is called the Croaker, either from the dull

croak it makes when taken, or by the ripple or plough of their nose on the water.

We have a fish on our shores the habits of which are very peculiar; it is called the Angler (*Lophius*



LOPHIUS PISCATORIUS.

piscatorius), for reasons which I will give you, and belongs to a small but singular group of fishes, which, from the peculiar conformation of their pectoral fins, can creep on land almost like little quadrupeds.

The ventral fins, shaped like a fan, are placed very far forward on the body; and the pectorals, from their position, perform the office of hinder feet. This fish has been called Frog-fish, from its resemblance in shape to a frog in the tadpole state; its head being enormously large and flat, and the body without scales and slender. Its habits ap-

peared to the fishermen of former days so exact a representation of the art they themselves practised, that by common consent they called it the Fisher. In Scotland it is called Sea-Devil, and Wide-Gab. The most common size is about three feet. It has a most voracious appetite, and, as it is not a good swimmer, it is supposed to be obliged to use artifice in order to satisfy its wants. Upon the head you see two slender appendages, the first of them broad and flattened towards the end, which has a shining silvery appearance. These filaments are curiously fixed in the head, and have great freedom of motion in every direction, the first filaments especially; this, according to Monsieur Bailley, is produced by no less than twenty-two muscles. "These elongated shafts are formed of bone, covered by the common skin; and, as the soft parts are abundantly supplied with nerves, they may also serve the Angler as delicate organs of touch. The uses to which they are applied are singular. While couching close to the ground, the fish, by the action of its ventral and pectoral fins, stirs up the sand or mud; hidden by the obscurity thus produced, it elevates these appendages, moves them in various directions by way of attraction as a bait, and the

small fishes approaching either to examine or seize them, immediately become the prey of the Fisher. Numerous are the writers that have borne testimony to this habit, and some have extolled it as raising the intellectual character of this fish beyond that of most of its class. Half the animal world seem destined to destroy each other, some by open violence, others by stratagem; and this design in the Angler, though very singular, is no more wonderful than that of spiders among insects, who spin and repair their widely-spread webs to catch other insects upon which they subsist.”*

Mr. Couch says that it is so voracious that it make but little difference what the prey is, either in respect of size or quality. A fisherman had hooked a cod-fish, and while drawing up the line he felt a heavier weight attach itself to it; this proved to be an Angler of large size, which he compelled to quit its hold by a heavy blow on the head, leaving its prey still attached to the hook. In another instance an Angler seized a conger-eel that had taken the hook, but after the latter had been engulfed in the enormous jaws, and perhaps stomach, it struggled through the gill aperture of the Angler, and in that

* Yarrell's British Fishes.

situation both were drawn up together. I have been told of its swallowing the large ball of cork employed as a buoy to a deep sea-line; and the fact this implies, of its mounting to the surface, is further confirmed by the evidence of sailors and fishermen, who have seen it floating, and taken it with a line at mid-water. "When taken in a net, its captivity does not destroy its rapacious appetite, but it generally devours some of its fellow-prisoners, which have been taken from the stomach alive, especially flounders. It is not so much sought after for its own flesh as for the fish generally to be found in its stomach: thus, though the fishermen reject the fish itself, they do not reject those that the fish has collected."

I must not pass over what, to the gourmand, is the king of fish, and which is frequently found on our western shores, the Red Mullet (*Mullus surmuletus*), though, except for the extraordinary value once set upon it, it is little worthy of observation. They were well-known to the ancients, and the generic term *Mullus*, by which they are distinguished, is said to have reference to the scarlet colour of the sandal or shoe worn by the Roman consuls, and in later times by the emperors, and

which were called *mulleus*. So much were these fish in estimation, that a Mullet of large size appears always to have been an object of particular admiration, and sometimes of contention. A fish of three pounds weight produced a considerable sum to the fortunate fisherman ; while the cost of a fish four pounds and a half, says Martial, was quite ruinous. A Mullet of six pounds is recorded to have produced a sum equal to 48*l.*; one still larger, 64*l.*; and even 240*l.* were given for three of very unusual size, procured in one day for a repast of more than usual magnificence.



CHAPTER IX.

The ocean smiling to the fervid sun,
 The waves that faintly fall and slowly run,
 The crimson weeds whose spreading fibres flow,
 Or lie like pictures on the sand below,
 With all those bright red pebbles which the sun
 Through the small waves so softly shines upon,
 And those live lucid jellies, which the eye
 Delights to trace, as they swim glittering by.

I SCARCELY know any specimen of the whole animal kingdom, or production of the vegetable world, which, as an object, is more beautiful than some of the smaller tribes of sea-weeds, called *Confervæ*. If nothing but the outward appearance be considered, they are most attractive; but when the internal structure, with the peculiar manner in which they perfect their seeds, is examined, they may be pronounced among the most wonderful of such or similar objects.

Sea-weeds, spoken of as a distinct class, are known by the general name of *Algæ*; this class is

separated into two great divisions, *Fuci* and *Confervæ*. The former are mostly of the larger species, and without any joints or divisions in the frond; while the *Confervæ* are chiefly distinguished from the *Fuci* by the jointed structure of the filament. This circumstance of itself is not altogether sufficient to separate them, though it is enough for a general mark of distinction. But in this, as well as in every other division of created objects, the classes run almost imperceptibly into each other; so that a few *Fuci* have joints, while in the main stems of some *Confervæ* the joints are scarcely to be discovered.

There is no climate, from the poles to the equator, entirely free from these plants. Species abound likewise in fresh water, whether running or stagnant, and in mineral springs. The strongly impregnated sulphureous streams of Italy, the eternal snows of the Alps and arctic regions, and the boiling springs of Iceland, have each their peculiar species; and even chemical solutions, if long kept, produce *Algæ*.

Some are so exceedingly minute as to be wholly invisible to the naked eye, and require the highest powers of our microscopes to ascertain their form

and structure. Others, growing in the depths of the great Pacific Ocean, have stems which exceed in length the tallest forest trees.

My heart is aw'd within me when I think
Of the great miracle that still goes on
In silence round me, the perpetual work
Of His creation ; finish'd, yet renew'd
For ever.

How well has Mr. Harvey observed, in the introduction to his *Manual of the British Algæ*, that the Creator, while He has scattered the Algæ through the waters of every climate of the globe, has assigned to each country the peculiar kinds best suited to the circumstances under which they are developed ; and it would be absurd to suppose that so much bounty and foresight had been wantonly squandered upon objects from which no direct benefit to His other works was to reciprocate. To preserve a harmony through creation, by giving to the depths of the sea a vegetable clothing, as beautiful and varied, yet as linked together as that of land, and thus to illustrate His own infinity and individuality by works endless in diversity, yet one in plan, may seem to many minds a sufficient motive, were there no other, for the exercise of an

unlimited creative power ; but it will not account for that nice discrimination and foresight with which he has regulated the supply of different kinds to different circumstances. We must, therefore, look further, and inquire what are the direct uses of Algæ in the general economy of nature. On land it is only necessary to glance around us to perceive that the animal kingdom could not exist without the vegetable ; “ beasts of the forest and fowls of the air,” countless myriads of the insect tribe, and man himself, all depend more or less on vegetables for their food and clothing. The sea, too, has its hordes, at least as numerous as those of the land, to which the Algæ afford food and shelter, and on whose existence, contemptible as many of them seem, depends, in a greater or a less degree, the preservation of every scale of life in the sea. Many of these little animals are so minute, that at first sight it would seem a matter of very little consequence to us (for when we speak of “ uses,” the words “ to man” are too generally understood,) whether they should starve or not. But when it is remembered that the principal food of the whale consists of a minute jelly fish, which is scarcely more than an animal sac moving by contraction,

and that by far the greater part of the fishes, important as articles of food to man, depend on minute marine animals for support, a different estimate will be formed of the importance of the lower links of the chain of creation to the whole, and we shall come to the conclusion that there is such a mutual dependence between one living creature and another, that none but the All-wise can dare to determine whether one, the most minute, can be spared without endangering the destruction of all. The Algæ, therefore, by supporting the base, support the structure. But, besides this, another important function is unquestionably performed by their growth, tending to keep pure the waters of the sea and lakes, and thus to preserve a healthful atmosphere. Like other plants they discharge a large quantity of oxygen.

Each moss,

Each shell, each crawling insect, holds a rank
Important in the plan of Him who framed
This scale of beings ; holds a rank, which, lost,
Would break the chain, and leave behind a gap,
Which Nature's self would rue.

This species (*Dasya coccinea*) is found abundantly on all our shores ; and, though of such com-

mon occurrence, few exceed it in beauty, and none meets with more general admiration or is used more



DASYA COCCINEA.

frequently in ornamental devices by the female visitors of our shores. The main stem is generally as thick as common twine; the divisions sometimes not to be distinguished, mostly of a darker red

than the branches, and a more uneven and hairy surface. The first shoots are dispersed without any regular order, of unequal length, and beautifully feathered with alternate branches: these also are again feathered, and end with such minute branches, and issuing so nearly together, as to give them a pencil-like appearance. The seed-vessels are in the forks of the little branches, and of an oval form. When this *Conferva* is thrown up on the shore and exposed to the sun, it loses its dull deep pink colour, and becomes a very rich scarlet-crimson.

In colour the *Algæ* exhibit three principal varieties, with, of course, numerous intermediate shades, namely, grass-green, olive-green, and red. The grass-green is characteristic of those found in fresh water, or in very shallow parts of the sea along the shores, and generally above half-tide level, and is rarely seen in those which grow at any great depth. To this rule there are exceptions; the great mass, however, of the green-coloured species are inconsiderably submerged. The olivaceous brown or olive-green is almost entirely confined to marine species, and is the main characteristic of those that grow at half-tide level, becoming less

frequent towards low-water mark; but it frequently occurs also at greater depths, in which case it is very dark, and passes into brown or almost black. The *red* also is exclusively marine, and reaches its greatest size in deep water. When it occurs above half-tide level, it assumes either purple, or orange, or yellow tints, and sometimes even a cast of green, but in these cases it is sometimes brightened by placing the specimens for a short time in fresh water.

How far below low-water mark the red species extends, has not been ascertained, but those from the extreme depths of the sea are of the olive series in its darkest form. For the colours of these last it has puzzled botanists not a little to account. It is well known that *light* is absolutely necessary to the growth of land-plants, and that the green colour of their foliage altogether depends upon its supply; and if they be placed even in partial darkness, the green quickly acquires a sickly, yellowish hue, and finally becomes whitish. But with Algæ it is different. At enormous depths, to which the luminous rays, it is known, do not penetrate, species exist as fully coloured as those along the shore. They, therefore, in this respect, either differ from

all other plants, or, perhaps, what are called the chemical rays, in which seem to reside the most active principles of solar light, may be those which cause colour among vegetables, and these may penetrate to depths to which luminous rays do not reach.*

The geographical distribution of the colours is pretty accurately thus : olive-green increases as we approach the tropics, red abounds chiefly in the temperate zone, and grass-green is the colour of the majority of those found in the polar seas. Heat converts the colour of most species into green ; and if any of the large Fuci be plunged into boiling water, they rapidly assume a bright green, but on removal revert to their original olive, and finally change to a brownish black.

Here is another Conferva, highly elegant and curious, common upon most of the rocks on our shores, or growing upon corallines. It is generally found in bushy masses, seldom exceeding two inches in length, variable in colour from a bright to a purplish red, but is easily distinguished by its rigid yet brittle filaments, which break in the hand, as if the joints separated like those of an Equisetum

* Harvey.



CERAMIUM CILIATUM.

(Mare's-tail). It is the *Ceramium ciliatum*. The branches, you will observe, are repeatedly forked,

the joints swollen, while a circle of clear spines surrounds each, and gives the plant a beautiful appearance ; the divisions are rather distant below, but very close above, while the tips are strongly hooked inwards. The seed-vessel also is protected by two or three curled little branches.

This, which is growing on the rock, is one of the largest, if not indeed the largest of British Confervæ, it is commonly known by the name of Lobster-horn Conferva (*Polysiphonia elongata*), from its branches, by their divisions, resembling that part of the lobster. The main stem is as thick as common twine, and is of much firmer texture than most species. Under the higher powers of the microscope the veins present a very remarkable and curious appearance, interlacing each other in a singular manner. It has sometimes been brought to the London market attached to the shells of oysters.

The Fucus which is growing in the pool, every leaf of which appears of a brilliant metallic hue, is called, from its slightly pungent flavour, Pepper Dulse (*Laurencia pinnatifida*). This peculiar brilliancy it shares with some few others, but when removed from the water it entirely disappears. Very few plants vary so much in colour as this



POLYSIPHONIA ELONGATA.

does : when it grows near low-water mark, it is of a fine, deep purple red ; a little higher up it is a

dull purple brown ; higher still a pale brownish red, and at last, near high-water mark, it is often inclined to yellow or to green. This example shews us, that, though the colour in sea-weeds is often a characteristic mark, it is not in all cases to be depended upon.

When speaking of the brilliant colours of marine objects, I must mention an animal called, from its hairy covering, the Sea-Mouse, or, from its form, the Sea-Caterpillar (*Aphrodita aculeata*). This curious creature is frequently met with, and is from three to five inches long ; it is covered with scales, which are concealed by a thick close felt of hair ; the sides are clothed with long, silky, green and golden hairs, clustered in small bunches, and glistening like burnished metal. The very vivid and brilliant hues which the hairs of this remarkable worm reflect, render it an object of wonder and surprise even to the most incurious ; they are not equalled by the colours of the most gaudy butterfly, and rival the splendours of the diamond beetle. Linnæus, speaking of this, says, “ that, reflecting the sun-beams from the depths of the sea, it exhibits as vivid colours as the peacock itself spreading its jewelled train.”

The curious animal known by the name of Sea-Hare (*Lepus marinus*) was once very famous in the annals of superstition. Its modern name is *Aphysia depilans*. This creature, it was once believed, held so great an antipathy to man, that the mere touch of it would cause the hair to fall off, (hence the specific name *depilans*.) That such an animal should be thought to supply a potent poison is not wonderful; and, accordingly, we are told that Nero mixed it with the food of those inimical to him, and that with this poison Titus was despatched by Domitian. Its operation was speedy, and inevitable destruction the effect; but it was not often used, as it was believed to betray itself by some peculiar symptoms. And yet it is curious, that, notwithstanding this has been said by very grave men, and very gravely too, modern naturalists have proved it to be perfectly harmless, neither offensive to the smell nor poisonous to the touch. The *Aphysia* has the power of discharging a purplish liquid when disturbed, which prevents its being seen.*

This piece of bone, or rather of a bony substance, is one of those which form the remarkable kind of

* Pursued, he bids the sable fountain flow,
And wrapt in clouds eludes the impending foe.

gizzard belonging to the wood-like Bulla (*Bulla lignaria*). By means of this, the animal is enabled to crush and grind the substances on which it feeds. It is extremely voracious, a quality indeed which belongs to most of the inhabitants of the sea ; and Mr. Sowerby mentions one of the genus, *B. aperta*, which was completely distorted in its shape, from having swallowed a thick, strong shell nearly equal in size to itself. The shell is very open, and, for the most part, thin, delicate, and semi-transparent. There are several British species, of which the Umbilicated and Glassy Bulla (*B. umbilicata* and *B. hyalina*) are very minute. The shelly gizzard, which I have mentioned, and which, as we have seen it, is frequently found alone, was for some time imagined to be a distinct shell, and a new genus was formed by Gioeni, who gave it his own name. He even went so far as to describe the habits of the pretended animal. The disgraceful deception, however, was soon discovered, and its author deservedly exposed.

“ The busy, active little birds, flocks of which we now see running incessantly with a light tripping motion up and down, and here and there, in search of shrimps, sea-worms, or small shell-fish, are of the

tribe called Waders. They are web-footed, but, as they rarely swim, the use of the web is supposed to be to support them as they run lightly over morasses or soft muddy spots. We will approach near to them, when they will all take flight at the same instant, with a whirring whizzing sound, and a loudish whistling cry, from which they have been called 'Sandpipers.' They also have the names of Dunlin, or Sea-Snipe, from their long bill. The flock now appears like a little dark cloud, because we see only their backs, but, while I am speaking, our eyes are almost dazzled by the bright white of the delicate plumage underneath, occasioned by the instantaneous turn of their bodies. Now they seem to disappear as they dart along with their wings edgeways towards us. It is impossible to watch a flight of these merry, sociable little birds, without pronouncing them to be a happy race, with all the enjoyment, and few of the cares of life. The skulking, solitary gunner, who prowls about the shore, appears to be their only enemy; and, conscious of their power of keeping aloof, they seem to treat him with indifference. Some species of these birds, such as the Ring Dotterel, or Sea-Lark, have advantages over other birds with respect to their

young, being enabled on the appearance of danger to carry them out of harm's way. There can be no doubt of this curious fact. One of these birds was seen on a rocky shore in Anglesey, running over a sandy patch a few yards off, accompanied by two young ones. On finding herself surprised, she immediately rose with one of the young ones, either caught up, or clinging to her by its own exclusive efforts. Whether from a wish to remain as near as possible while the other was in danger, or from the additional weight, could not be ascertained, but her flight was short, and she alighted on a rock at no great distance. The remaining little one was with difficulty overtaken, as it ran with great activity and swiftness, although very young, being covered with down, and evidently not long hatched. Most of the little birds of this tribe make no regular nests, but deposit their eggs, four in number, either in a slightly-scratched cavity among sand and pebbles, which they so much resemble in size and colour that they are not easily discovered, or, like the Sea-Snipe, on the ground, among long grass and heather; they construct a nest of a little moss, and some dry leaves and fibres. The bird contrives to place her eggs so

that they occupy the smallest possible space ; and this she effects by making them all meet at their



NEST OF THE DUNLIN.

smaller ends, which also taper much more than most other birds'. The four little eggs, for though similar in colour, they are much smaller than a snipe's, huddled in so narrow a compass, require a keen and accustomed eye to see them, and at the same time are easily covered by the parent bird.

Her affection for her young is not confined to them when unable to take care of themselves after hatching, but is manifested when they are still in the egg; for should a stranger disturb her, she will, instead of running or flying away in her usual manner, immediately affect lameness, or decoy him away from the nest by tumbling over and over, as if in the last stage of weakness or decrepitude. Or if actually found upon her nest, she will nobly persevere in sacrificing herself, rather than desert it. In two instances, among many, they were found to sit so close, that they allowed themselves to be lifted off their nests rather than fly away.”*

During winter many dozens are shot for the table on various parts of the coast, and are considered to be very good eating. In the autumn of 1836, a few were sent to the London market from Lincolnshire, where they had been fatted in confinement with some Ruffs. These small birds, from abundance of nutritive food, had increased beyond their usual size, were very fat, delicately white in colour, and by the party for whom they

* Stanley's British Birds.

were purchased, and by whom the birds were eaten, were said to be of excellent flavour.”*

Mr. M^c Gillivray says, that, about the middle of April, these birds betake themselves to the moors, in the northern parts of Scotland and in the larger Hebrides, where they may be found scattered in the haunts selected by the Golden Plovers, with which they are so frequently seen in company, that they have obtained the name of “Plovers’ Pages.” Like the Gull, the plumage of the Dunlin becomes of a paler colour during winter. You will find a very pretty drawing of the young chick in *Yarrell’s British Birds*.

The form of the beak has given this bird its English name of Sea-Parrot. It is only a summer visitor to our coasts, making its appearance in April, and departing early in August. The Scilly Isles were held in the fourteenth century under the king, as Earl of Cornwall, by Ranulph de Blancminster, for an annual payment of 6s. 8d., or 300 Puffins at Michaelmas.

These birds lay their single large egg in deep holes, and crevices in the perpendicular surface of

* *Yarrell’s British Birds*.

cliffs, at the depth of three or four feet from the front. They will even contend with rabbits for the possession of some of the burrows. Many Puffins dig their own burrows, and commence this operation early in May: the hole is generally excavated to the depth of three feet, often in a curving direction, and sometimes with two entrances. The males principally perform this work, and are so intent upon it, as to frequently admit of being taken by the hand, and the same may be done while the eggs are being hatched. At this period specimens may be obtained by thrusting the arm into a burrow; but you run the risk of getting a severe bite from the powerful beak of the old bird. The egg is deposited at the further end of the hole, and is nearly as large as that of a pullet. It is white when first laid, but soon becomes soiled and dirty, from the surrounding earth, no materials having been collected as a nest. Pennant mentions, "that, when the time for migration arrives, such young birds as cannot fly are deserted." But they are, previous to this, very attentive to their offspring, and may frequently be seen with several small fish hanging from their beaks, as a meal for the young Puffins.

At St. Kilda the Puffins are said to be taken when sitting on the rocks, by means of a noose of horse-hair attached to a slender rod of bamboo cane. This mode is most successful in wet weather, as the Puffins then sit best upon the rocks, allowing a person to approach within a few yards, and as many as 300 may be taken in one day by an expert bird-catcher. They are caught for their feathers.

The Gannet, or Channel Goose, is a constant resident on our coast, and large numbers congregate in different parts of it to breed. One favourite resort for this purpose is Lundy Isle, off the coast of Devon, where one spot is called Gannet Cove, from the numbers which resort there. The Bass Rock in the Frith of Forth is rented from the proprietor at 60*l.* or 70*l.* per annum; and, as the proceeds chiefly depend on the produce of the Gannets, great care is taken to protect the old birds, and within a limited distance of the island no shooting is allowed.

They dive in the gulf, or triumphantly ride,
Like foam, on the surges, the swans of the tide,

in perfect security, and consequently during breeding time become very tame: they will even allow

themselves to be stroked by the hand without any resistance, or any show of impatience except a low guttural note. Their plumage is beautifully soft and white, "thick without burden, close as fishes' scales:" the head and neck are buff-colour. They feed exclusively on fish, and off the Cornish coast, from their taste for pilchards, often direct the fisherman in his course. The Gannet captures its prey in a different manner from any of our aquatic birds; for, taking a very wide range over the sea in all directions, as soon as it discovers the fish, it rises to such a height as experience shews best calculated to carry it by a downward motion to the required depth, and then, partially closing its wings, it falls perpendicularly on the prey, and rarely without success. Gannets attracted to the same shoal, and fishing in company, are frequently caught in considerable numbers, by becoming entangled in the meshes of the fisherman's long sea-net.

This substance, which looks like a mass of white jelly melting in the sun, incapable of motion, and shewing but few traces of organisation, if carefully examined, would be discovered to possess a most peculiar and elaborate structure. Smaller species

of this tribe are seen floating by thousands near all our coasts during the summer and autumn. Their uncouth appearance has obtained for them various names by which they are familiarly known, as Sea-Jelly, Sea-Blubber, or Jelly Fishes ; whilst, from the disagreeable sensation produced by handling most of them, they have been called Sea-Nettles, Stingers, or Stang Fishes. Sea-Nettles, indeed, is the name by which they were known to ancient naturalists.

There are few subjects which come under observation more calculated to excite astonishment than the history of these creatures. If the composition of their bodies be considered, what is found ? An animated mass of sea water : for such in an almost literal sense they are. And if one of them be laid in a dry place, it will be found gradually to drain away, leaving nothing behind but a small quantity of transparent matter, almost as delicate as a cobweb, which apparently formed all the solid framework of the body, and which in an animal weighing five or six pounds will scarcely amount to as many grains ; and even if the water which has escaped be collected and examined, it will be found to differ in no sensible degree from

the element in which the creature lived. The microscopic creatures which so abundantly people the ocean furnish them, no doubt, with an ample provision of food. But it is not upon such humble prey that some of this tribe feed: many are enabled, in spite of their apparent helplessness, to seize and devour animals which seem to be far too strong and active to fall victims to such assailants; crustacea, worms, mollusca, and even small fishes, are not unfrequently destroyed by them. Incredible as this may seem when we reflect upon the structure of these feeble beings, observation proves they are fully equal to such enterprises.

The long filaments with which some are provided form fishing-lines formidable in arresting and entangling the prey; and in all probability the stinging secretion which exudes from the bodies of these animals speedily paralyses and kills the animals which fall in their way. Extraordinary as must appear the powers which these animals possess of seizing and dissolving other creatures, apparently so disproportioned to their strength, and the delicate tissues which compose their bodies, there are other circumstances of their history equally remarkable, which, in the present

state of our knowledge, are still more inexplicable. We are at a loss to account for the production of the irritating secretion in which the power of stinging seems to reside ; but it is observed that the feelers seem to be more imbued with it than any other part of the body. Mr. Jones, in his *General Outline of the Animal Kingdom*, from whose work the preceding remarks are taken, goes on further to speak of a subject I have mentioned before, viz. the luminosity of the ocean, and mentions the phosphorescence of this family as one of its most remarkable properties.

“ We have more than once witnessed this phenomenon in the Mediterranean ; and the contemplation of it is well calculated to impress the mind with a consciousness of the profusion of living beings existing around us. The light is not constant, but only emitted when agitation of any kind disturbs the microscopic medusæ which crowd the surface of the ocean : a passing breeze, as it sweeps over the tranquil bosom of the sea, will call forth from the waves a flash of brilliancy which may be traced for miles ; the wake of a ship is marked by a long track of splendour ; the oars of your boat are raised dripping with living diamonds ; and, if

a little of the water be taken up in the palm of the hand and slightly agitated, luminous points are perceptibly diffused throughout it, which emanate from numerous little animals scarcely perceptible without the assistance of a microscope. All, however, are not equally minute. There is one, called the



BEROE PILEUS.

Girdle of Venus, which, as it glides rapidly along, has the appearance of an undulating riband of flame several feet in length; and many of the larger forms shine with such dazzling brightness,

that they have been described by navigators as resembling 'white-hot-shot,' visible at some depth beneath the surface."

The Globular Beroe (*Beroe pileus*) was found by Dr. Grant in the harbour of Sheerness. The boat-men call it the spawn of the Sea-egg (*Echinus*), which it somewhat resembles in its globular and ribbed form; but the rows of the ciliæ, when viewed through a microscope, are slightly curved backwards, so that the whole apparatus gives not a very bad representation of the paddle-wheel of a steam-boat.



CHAPTER X.

Were every flattering tongue of man,
 Almighty Father ! silent in thy praise,
 Thy works themselves would raise a general voice ;
 E'en in the depth of solitary shores,
 By human foot untrod, proclaim thy power.

“ THE sea-shore is not very commonly the resort of animals, but, as the Otter lives almost exclusively upon fish, when it can procure them, it frequents not only lakes and rivers, but not unfrequently descends to the sea, especially in the north of Scotland; and the havoc it makes among the finny inhabitants is almost incredible. In feeding, it holds the fish between its fore-paws, eating first the head, and then downwards to the vent, leaving the tail. But it is not only to those which are necessary for its sustenance that its ravages are restricted, for, as honest Izaak Walton says very truly, ‘ The Otter devours much fish, and kills and spoils much more than he eats.’ ”* Mr. Couch of Polperro states, that

* Bell's British Quadrupeds.

“ in the summer, and when the weather will permit, it occupies a retired and quiet situation where the land stretches into the ocean. It swims low in the water, and will go a mile or more after its prey. The neighbourhood of a populous harbour is a favourite station.

“ Fishes seem to have an instinctive dread of the Otter ; it has been seen to collect into a shoal a vast number of trouts in a river, and to drive them before it, until the greater part have thrown themselves on shore.”

The Otter may easily be tamed and taught to catch fish for its master. Albertus Magnus has recorded, that in Sweden, Otters were kept in the houses of the great, for the express purpose of catching fish, which they would do at a signal from the cook, and bring home their provender to be dressed for dinner. In later times an Otter has been well known to take eight or ten salmon in a day. In Antrim, from its being in a wild state so extremely injurious to the salmon-fishery, a premium is paid for its destruction, and there are many persons who earn a livelihood by hunting the Otter, both for the sake of the reward and its beautiful black skin.

The Irish Otter has been supposed to be of a distinct species, but Mr. Bell thinks it is “no more than a very dark and handsome variety of the common species.” Bishop Heber, in his interesting *Journal*, remarks that “the simple Hindoo shews a far better taste and judgment in his treatment of the Otter than half the Badger-baiting and Otter-hunting gentry of England.

“We passed,” continues he, “on the banks of the river, (Malta Colly,) a row of no less than nine or ten large and very beautiful Otters tethered with straw collars and long strings to bamboo stakes. Some were swimming about to the full extent of their strings, or lying half in and half out of the water; others were rolling themselves in the sun on the sandy bank, uttering a shrill whistling noise, as if in play. I was told that most of the fishermen in this neighbourhood kept one or more of these animals, which were almost as tame as dogs and of great use in fishing, sometimes driving the shoals into the nets, at others bringing out the larger fish with their teeth. I was much pleased and interested with the sight. It has always been a fancy of mine, that the poor creatures whom we waste and persecute to death, for no cause but the gratifica-



THE SHRIMPER.

tion of our cruelty, might by reasonable treatment be made the sources of abundant amusement and advantage.”

Mr. Bell thinks “there can be no reason why the docile and tractable animal should not be very generally domesticated for the purpose of sport, or employed by fishermen as a means of assisting them in their calling.” If you should ever feel disposed to try the experiment of training an Otter, I recommend you to read the method he has given in his *History of British Quadrupeds*.

The Common Shrimp (*Crangon vulgaris*) is one among the many instances of the extraordinary fecundity of the animals of the deep; the quantity brought to the London market alone would, if mentioned, be scarcely credited, while every seaport and sea-village has them comparatively in the same abundance.

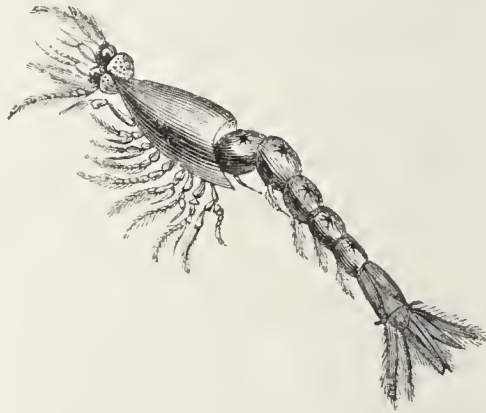
Though every animal has its use in the great economy of the creation, it is not always perceptible by man. The part assigned to Shrimps in the sea, and there is hardly any sea without some species of the race, seems to be that analogous to some of the insects on land, whose task it is to clear away the remains of dead animal matter, after the beasts

and birds of prey have been satiated. If a dead small bird or frog be placed where ants can have access to it, these insects will speedily reduce the body to a closely-cleaned skeleton. The Shrimp family, acting in hosts, as speedily remove all traces of fish or flesh from the bones of any dead animal exposed to their ravages. They are, in short, the principal scavengers of the ocean; and, notwithstanding their office, they are deservedly and highly prized as nutritious and delicious food.

So carnivorous are the propensities of the Shrimp in the Northern seas, that joints of meat hung out by Captain Parry's crew from the sides of the ship, were, in a few nights, picked to the bone; and nothing could be placed in their reach, except bodies of which it was desired to obtain the skeleton.

There is another kind of Shrimp, which to a casual observer seems very much to resemble the common one, though differing widely when carefully examined, and richly deserving notice from its peculiar construction. It is called the Opossum Shrimp (*Mysis Fabricii*), and derives its name, as you will naturally conclude, from a pouch

or nest provided for the reception of the eggs and young. This singular appendage belongs to the female only, which will account for the circumstance that so many have been found without it,



OPOSSUM SHRIMP.

and which has led to the supposition that it is a rare animal, whereas it is almost as abundant as the *Crangon vulgaris*. It belongs to the family of Fissipedes (cleft feet), from having all the feet or members divided to their very origin into two parts or limbs, the inner limb being constructed for progression and seizing their prey, and the outer one for swimming; possessing hands, if we

may so term them, as complicated and as beautiful in their adaptation and capabilities as those of man. Other Shrimps have a single row of five feet on each side, but this interesting animal has four rows, in each of which are eight feet, thirty-two in all, of which sixteen are for taking food, and sixteen for swimming.

How manifold thy works, O Lord !
In wisdom, power, and goodness wrought,
The earth is with thy riches stored,
And ocean with thy wonders fraught.
Unfathom'd caves beneath the deep,
For Thee their hidden treasures keep.

The Common Shrimp remains at the bottom, and, though not incapable of swimming, always appears to do it with an effort. They, as I have observed, clear the bottom of the sea of its numerous impurities ; while the *Myses* always swim near the surface, and devour the small *Medusæ* and the lighter portions of extraneous matter. During the still period of the tide at low-water they repose upon the mud and stones, contributing to the food of various young fish, from which they frequently escape by springing up out of the water.

Captain James Ross, R.N., states that one species, *M. Flexuosus*, though but sparingly found in the seas of Europe, inhabits some parts of the Arctic Ocean in amazing numbers, and constitutes the principal food of the prodigious shoals of salmon that resort thither in the months of July and August, and upon which the inhabitants of Boothia depend, in great measure, for their winter store of provisions. He further observes that it is also the chief food of the whale, by which such a prodigious quantity of fat is produced in the body of that immense animal. Captain Ross adds, that during the summer these crustaceans assemble in vast myriads at the mouths of rivers, but in the winter are more generally distributed along the whole line of the coast.*

The Prawn (*Palæmon Serratus*) is far superior to the Shrimp in size, beauty, and flavour. It is distinguished by having the two front pairs of feet cleft at the extremity, and by the stiff, sharp curved, and sword-like horn on the forehead, cut into teeth on each edge.

Prawns generally inhabit sandy bottoms near the coast, but some are found both at the mouths

* Appendix to the Second Voyage of Captain Sir John Ross.

of rivers and far up. The species of this delicious and useful genus are numerous, and all agreeable to the epicure. In warm climates they attain to a considerable size ; such are the *Palæmon Carcinus* of the Ganges and the Indian seas, which attains to nearly a foot in length, and the *Palæmon Jamaicensis* of the Antilles, which is from ten to twelve inches long.

In the Levant they salt the large species, which they preserve in large baskets, constructed principally of the leaves of the Palm tree ; they are then sent to Constantinople, Smyrna and into all the towns of Turkey, where the Greeks and Armenians consume a great quantity of them during their Lent and other times of abstinence.

Their usual mode of swimming is on their backs ; but, when danger threatens, they throw themselves on one side, and spring backwards to very considerable distances. Being in great request for the table, they are eagerly sought for by fishermen, who catch them either in osier baskets, similar to those employed in catching lobsters, or in a kind of nets, called putting-nets. These, which are well known to all frequenters of the sea-side, are five or six feet in width and flat at the bottom,

and are pushed along in the shallow water upon the sandy shores by a man who walks behind. At the side of the head of a Prawn you may frequently have observed a large and apparently unnatural lump. This, if examined, will be found to contain, under the horny skin, a species of crustaceous animals, which occupies the whole cavity, and there feeds and perfects its growth. Colonel Montague has given a very minute description of the animal, which occasions this singular distortion in the shell of the Prawn, he calls it *Oniscus (Bopyrus) Squillarum*.

Who loves not the gay butterfly, which flits
 Before him in the ardent noon, array'd
 In crimson, azure, emerald, and gold,
 With more magnificence upon his wing—
 His little wing, than ever graced the robe,—
 Gorgeous of royalty.

CARRINGTON.

Butterflies are not very commonly frequenters of the sea-shore, but I have occasionally taken two, which are much admired from their comparative rarity and beauty.

The Clouded-Yellow Butterfly (*Colias edusa*) is of a rich orange colour: the males have a roundish black spot on the fore wings, and a broad black

margin sharply waved within, through which the yellow veins, marking the nerves, are seen; the hinder wings have the disk darker, with a large bright orange patch. The female has the broad



THE CLOUDED YELLOW BUTTERFLY.

border marked with several irregular yellow spots, and the hinder wings are darker and yellower than in the male.

This is one of the species of butterflies whose periodical appearance (every three or four years, as stated by some writers) has so perplexed Entomologists. Various opinions have indeed been suggested by authors, in order to account for the singular circumstance, such as the failure of their natural enemies, an increased temperature, or the dormant state of the eggs until called forth by some latent coincidences. All these opinions are,

however, but merely conjectural; nor can the matter be cleared up until a more minute inquiry into the habits of the species has been made.

The Comma Butterfly (*Vanessa C. album*), is very variable in the indentations of the wings, which, however uncertain they may be, strongly



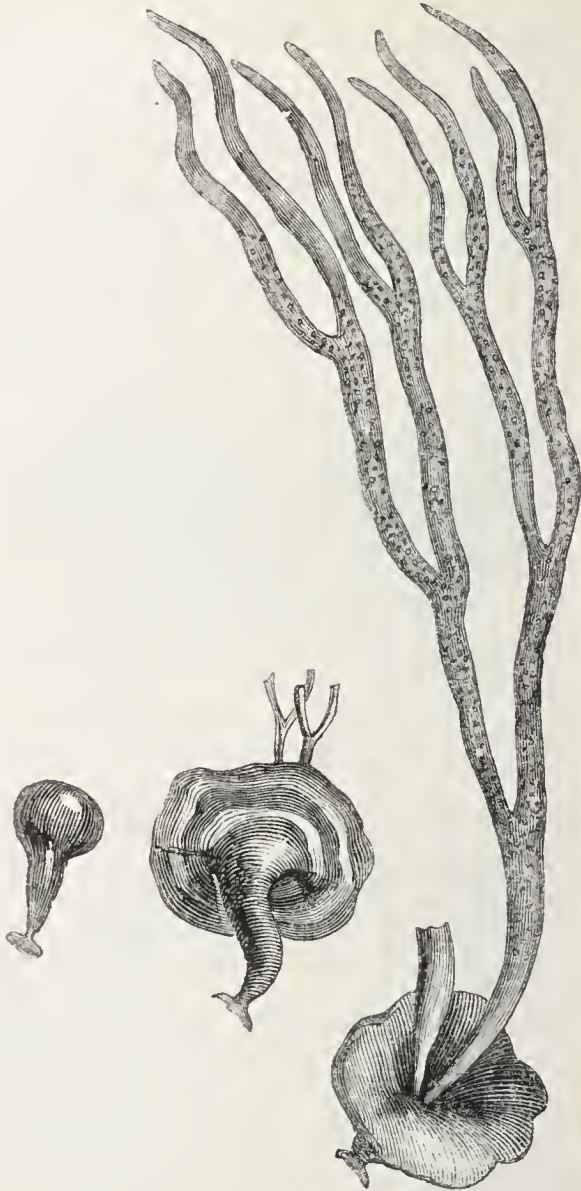
THE COMMA BUTTERFLY.

mark the Butterfly, as no British species has its wings so deeply and irregularly cut. It may be easily recognised also by the disk of the hinder wings being ornamented underneath with a white mark like a *C*, which is of various degrees of intensity in different individuals.

The genus to which this Butterfly belongs contains some of the most beautiful of our English Lepidoptera—the Great and small Tortoise-shell, the Pea-

cock, the Red Admiral, and the Camberwell Beauty. The latter is one of our rarest species, appearing only periodically, and at intervals of eight, or ten, or more years. In the year 1846, which was remarkable both for the heat and length of the summer, it was captured in many parts of England. It received its English name of the Camberwell Beauty from having been observed in that village, to which it was probably attracted by the willows, which grew there in profusion.

You are looking, I observe, at those dark green top-shaped things, about an inch in height, which are scattered at intervals on that piece of rock, they are the young *Fucus coreus*, or Sea-Thongs. You would scarcely suppose the long, thong-like substance you see lying there, some ten feet in length, belong to them, but so it is. Those little things, which now look as if they were nearly solid, will soon collapse, and from the centre of what then becomes like a cup there will issue these thongs, which are the seed-vessels, or receptacles in which the seed of the plant is imbedded. The small cup is the only part which is permanent; the thong, after it has fulfilled its function of retaining the seeds for their allotted



SEA-THONGS.

period, dies away, like the empty pod of a bean-shell, and is dissolved in the deep. It is curious to remark that the first receptacle only issues from the centre of the cup; the succeeding ones are irregular in the spot from whence they spring. The accompanying plate shews the mode of its growth: *a* represents the young frond, *b* the appearance soon after the receptacle begins to shoot, *c* when it has attained its greatest length.

A few specimens, beginning with the early state of the frond, and gradually proceeding with such as will shew the progressive lengthening of the receptacle, are pretty objects for the herbarium. Indeed, such are necessary for the sea-weed botanist, as shewing the incipient and the perfect state of the plant. Before being dried, they must be well washed in fresh water, and carefully wiped to get rid of the slimy substance which exudes, and then subjected to tolerably heavy pressure. When dry they become a dull greenish black.

This plant, which is something, but not much like it in appearance, is called Sea-Laces (*Chorda filum*): in the Orkneys it has the name of Sea-Cat-gut, and Lucky Minny's Lines. This last is given to it, because in some places the skin is

stripped from the frond when half-dry, which is then tightly twisted, and acquires so considerable a degree of strength and toughness that it can be used for fishing-lines. This plant appears as if it were round and solid, but when examined it proves to be a single flat fillet twisted spirally by the joining of the edges; while growing it is commonly fringed with delicate fibres, which give it a slippery feel. It may be found varying in length from one to twenty feet. Like other large Fuci, it was formerly employed in the manufacture of kelp, and in Norway is used as food for cattle.

In Scalpa Bay, in Orkney, according to Mr. Neill, this species forms meadows, through which with difficulty a pinnace forces its way.

Between these rocks there is a tolerably large pool, perfectly clear, the water partaking of the bluish colour reflected from the sides; so transparent is it, that the smallest pebble on the bottom may be clearly seen. It is so sheltered, too, that not a breath of air ruffles it, and it is almost impossible to imagine anything more beautifully calm and serene. If you stoop down and look under this slightly projecting ledge, you will see what will amply repay you for the little toil we have

had in scrambling down to it. You can scarcely believe, you say, that anything could grow in the sea of so lovely a colour. It resembles exactly the

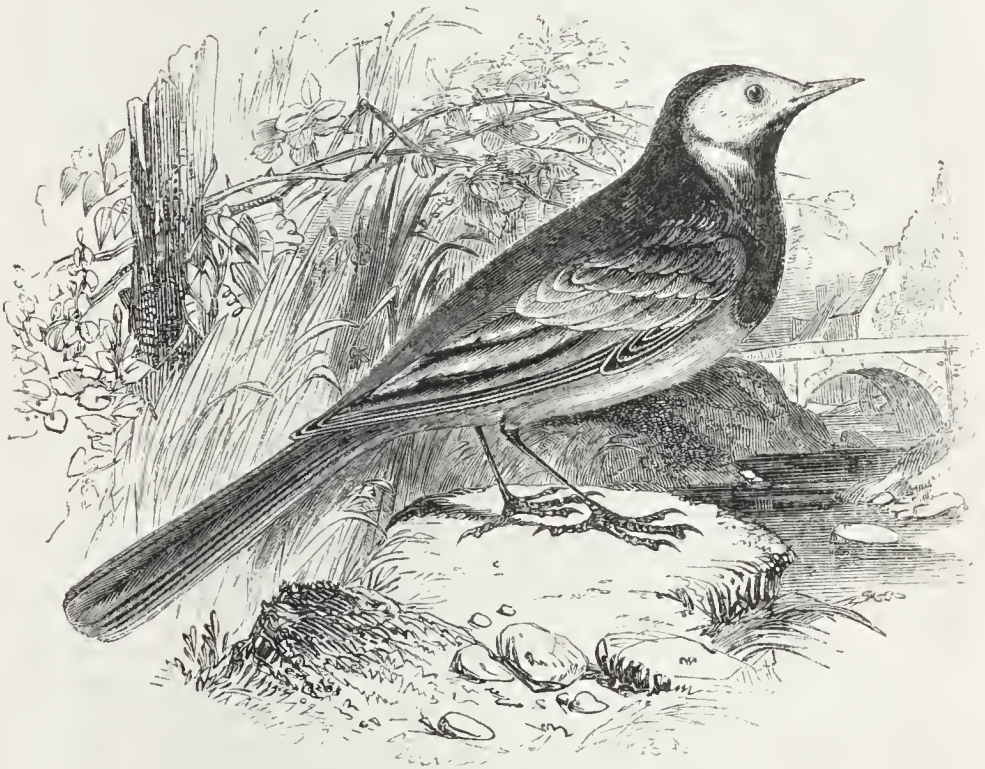


THE BLOOD-COLOURED FUCUS.

leaf of some land plant, but I may safely challenge you to produce a leaf from any plant of such a hue as that. It is the Blood-coloured Fucus (*Delesseria sanguinea*). The fronds, or leaves,

have a prominent midrib and lateral veins; the margin delicately waved, but entire; the colour a splendid pink, and as we now see it, with all its leaves expanded in this clear medium, it is, indeed, a sight not to be forgotten. In the elegance of its appearance, and the exquisite colour of its most delicately veined leaves, this beautiful *Fucus* carries away the palm, with no less justice, from the vegetables of the ocean, than the rose, the flower of the poets, does from its rivals in the garden. We can hardly help regretting that it cannot boast an equally delicious perfume. This is its summer appearance; in the winter you will frequently find it cast upon the rocks, the delicate portion of the frond decayed or battered, leaving little but the stem and midrib of the leaf, which, however, are fringed with fructification, and waiting the return of its appointed season to bud forth with fresh and renewed beauty. It adheres firmly to paper when dry, preserving its colour undiminished, and is of so delicate a texture, that most, who have never seen the plant in a living state, can hardly, even after passing the hand over it, persuade themselves that it is not a beautifully executed drawing.

You know that bird which has just flown down from the point of the rock, and is now running along the beach and picking up with extraordinary rapidity whatever it finds eatable. It is the



THE PIED WAGTAIL.

Pied Wagtail (*Motacilla alba*). The genus has its English name from the quick and almost incessant motion of the tail. The one we are looking at

runs with great swiftness, neither hopping nor requiring the assistance of its wings; and it does not sink when passing over the surface of very soft mud, nor does it manifest any unsteadiness when upon smooth and slippery pebbles; and when it is necessary to change from running to flying, it can take wing from either surface with great ease. When in pursuit of insects, it does not, like the swallow, catch them by straightforward speed, but by short and jerking flights. It undergoes considerable change of plumage preparatory to the winter, and those which are in the north leave it as soon as the cold sets in. The Wagtail sings early and sweetly, though its song is not loud. It is a very familiar bird, very lively, and very pretty, so that it is a general favourite, and we believe there are but few persons who do not stop in their walks to watch its quick and cheerful movements. The Bishop of Norwich, among the amusing accounts which he gives of singular places selected by birds for building their nests, mentions a Water Wagtail sitting on her eggs in the noisy workshop of a brass-founder's factory, "within a foot of the wheel of a lathe, in the midst of the din of ham-

mers and braziers. There, unmolested and unconcerned, she hatched four young ones. The cock, not reconciled to such a scene, instead of taking his part in feeding the nestlings, carried the food he collected to a spot on the roof, where he left it till the hen fetched it when wanted. She became quite familiar with the men who were constantly employed in the shop, and flew in and out without signs of fear; but if a stranger approached, she immediately flew off her nest, or, if absent, would not return till he had departed. We once found a Wagtail's nest under the half-deck of a pleasure-boat, which was anchored in a sheet of water. Several times from the discovery of the nest, to the final departure of the young ones, we embarked and sailed about, the old birds keeping a look out upon our motions, and frequently alighting on the gunwale, and finally rearing and flying off with their brood."*

Another little bird, which is very common on a sandy and muddy beach, is the Shore Pipit (*Anthus aquaticus*): he well merits his name, as he is rarely if ever found at any great distance from the sea. Many of them may be seen, but not in flocks;

* Stanley's Birds, vol. ii. p. 31.

it is a solitary bird. It finds the principal part of its food at and within high-water mark, but never in the water, except in those shallow pools where it can easily wade. It runs with great ease along the sand, picking up the small shell-fish ; and when alarmed, hops on with a bouncing flight. In the early part of the season, when most of the shore-birds have gone inland to nestle, and the sea-birds have fled to their favourite rocks and islands, the Pipit is almost the only winged creature met with on the long and solitary stretches of beach.

Oh wander like a breeze
By lakes and sandy shores ; so shalt thou see and hear
The lovely shapes and sounds intelligible,
Of that eternal language, which thy God
Utters, who from eternity doth teach
Himself in all, and all things in Himself.
Great Universal Teacher ! he shall mould
Thy spirit, and by giving make it ask.

COLERIDGE.

The strange-looking thing so firmly fixed to this stone is the Tufted Canoe-Shell (*Chiton fascicularis*), and, from its resemblance to jointed armour, it is commonly called the "Coat of Mail." Early naturalists, who always indulged largely in the love of the marvellous, imagined the shell to

be the covering of a serpent invested with peculiar terrors. The shell consists of eight narrow transverse plates, overlapping each other down the back, and fixed firmly in the thick and fibrous skin of the animal, which forms a ridge round them. These plates are not immoveable, as the animal is enabled, when alarmed, to roll itself up like the Common Wood-louse.

The species are numerous, and are to be found on rocks between high and low-water mark, on stones and sub-marine substances, on the stems of the larger sea-weeds, and on the bottom of ships returned from tropical voyages. This has valves, apparently smooth; but, when examined with a glass, they will be found to be rough, like shagreen, except on the elevated ridge of the back: the margin is surrounded with tufts of whitish hair; colour brown.

Another species, *C. albus*, or White Canoe-Shell, is of greater rarity than this, but may not unfrequently be found upon *Ulva lactuca* and other plants of the same genus.

Varieties of the Chiton are now and then met with, which have seven plates instead of eight.

The mouth of the animal which inhabits the

shell is furnished with a great number of teeth variously formed, and placed in longitudinal rows. It is a night feeder, and is comparatively more nimble in its movements than the Limpet.

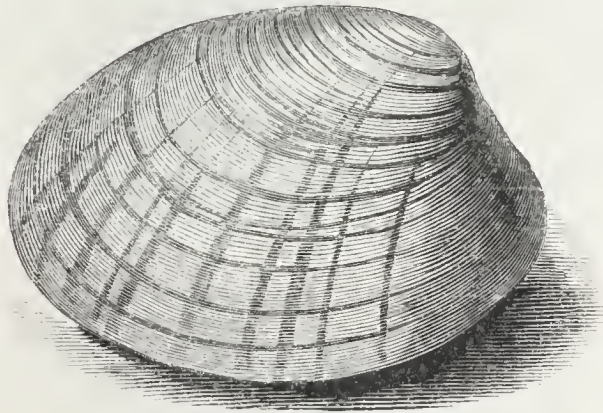
“When we consider,” says Mr. Kirby, “that these animals are not only exposed to the violent action of the waves, but also to the attack of countless enemies, we see abundant reason for the coat of mail with which their Creator has covered them. Even the fleshy or cartilaginous margin is defended by scales, spines, and bristles, and at others rough with numerous little bony tubercles.”*

It is admirable to remark, also, how each animal of the lowest kind, such even as the Chiton and the Limpet, is provided with an instinct which directs it to use the proper means for its preservation when placed in positions and under circumstances, which, without such instinct, would be fatal to it. In hot days the Limpet sticks firmly to the rocks, so as to prevent the escape of the confined moisture. Some shell-fish have the power of withdrawing their organs for breathing into sheaths when they frequent the bare rocks; others

* Bridgewater Treatise, vol. i. p. 271.

cover themselves with wet sea-weeds, or lurk in shady crevices: some retire to pools among the rocks which are not drained at low water; others adhere to the dripping under surface of cliffs, or frequent shady places. The common Mussel, which is so frequently exposed on the bare rocks to the influence of the sun and air, has the valves fitting to each other with such exactness as to prevent all evaporation.

When the valves are open at any part, the animal either inhabits deep water, as many species of the Pecten, or has the power of burrowing in the mud or sand when left dry by the ebb of the tide.

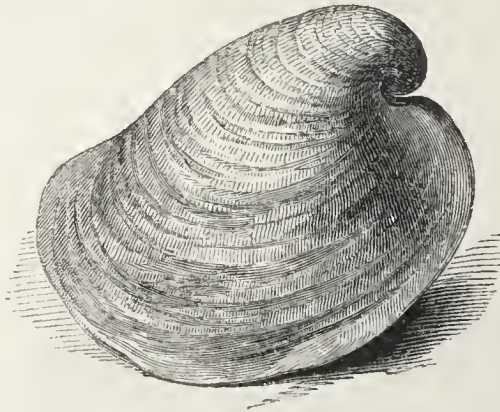


VENUS CHIONE.

This single valve belongs to the Venus Chione.

The brown epidermis has been washed off, so that the marks upon the shell can be seen; it takes a beautiful polish, and is on that account much prized by those who collect a few shells as ornaments for the mantel-piece or the drawing-room table.

Close together on the same large piece of rock we see the curious Key-hole Limpet (*Fissurella*), and the Hungarian Bonnet, or Torbay Night-cap,



THE HUNGARIAN BONNET.

as it is sometimes called, from the place where it is found and the shape. The storm must have been violent, which could move so great a mass of rock; and, had we been here, we should have realised

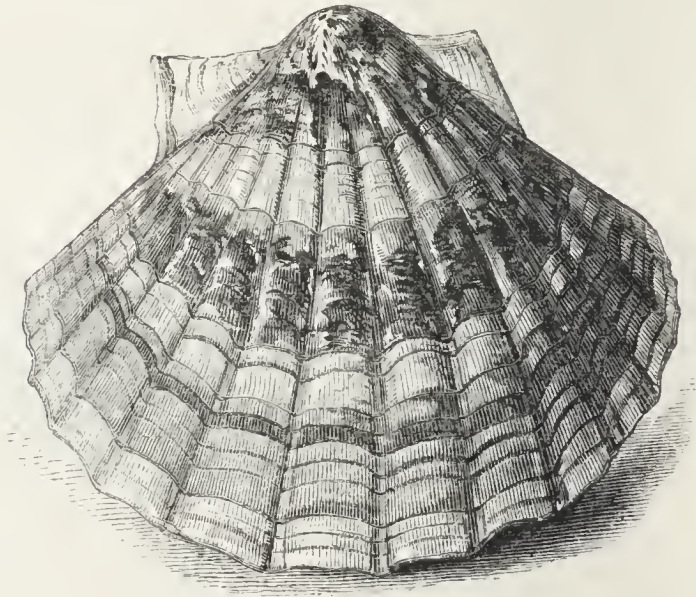
the description of the poet, and might have looked

Around us to behold
Far up the beach, the yesty sea-foam roll'd,
Or from the shore upborne, and seen on high,
Its frothy flakes in wild confusion fly ;
While the salt spray that clashing billows form,
Gave to the taste the feeling of the storm.



CHAPTER XI.

THIS shell with fourteen rounded ribs is one valve of the Great Scallop (*Pecten maximus*), common on



THE GREAT SCALLOP.

many parts of our coast, and frequently exposed for sale in fish-markets, being by some persons highly

esteemed for the table. Old and experienced dredgers say that the greatest quantity are taken after a fall of snow. The painted Scallop (*Pecten specularis*), a common shell also, has about twenty rounded ribs; the colour is various, very frequently white, beautifully variegated with red or purple; sometimes of one colour only, white, yellow, brown, or purplish: the under valve always most highly coloured. The inside is white, in some parts a little tinged with brown.

This species is also frequently eaten, and is known by the name of Frills or Queens. Both this and the former are pickled and barrelled for sale.

A curious species is the *Pecten distortus*, which, when affixed by the valve to rocks and old shells, accommodates itself to all the inequalities of the part to which it is affixed. The upper valve also partakes more or less of these irregularities. It is a small shell, rarely exceeding two inches in length, and one inch and a half in breadth. It is sometimes attached to the inside of an old Oyster-shell, and has been found so imbedded in the large stones used for fixing the mooring-chains to in Plymouth Harbour, that it became necessary to break off part of the stone to get them out.

The shell of the *Pecten Jacobæa*, or Pilgrim Scallop, was formerly worn on the hat or coat as a mark that the wearers had crossed the sea for the purpose of paying their devotions in the Holy Land. It was not, however, only the mark of pilgrimage to the Holy Land, but this species has been termed the shell of St. James the Greater, as being his peculiar cognisance. The great Spanish military order of Santiago de la Espada is said to have been instituted in memory of the battle of Clavijo, in which no less than 60,000 Moors were killed. At the battle (such, alas! was the belief) St. James appeared on a white horse, the housings charged with escallops, his own particular cognisance, fighting for the Christians under Ramira, King of Leon, in the year 844. The saint was thus represented in his military character on the standard of the order used in the army of Ferdinand and Isabella at the conquest of Granada. The city of Compostella, in Gallicia, became the seat of the order of St. James, from the legend of the real body of the saint having been discovered there in the eighth century, and which became almost immediately an object of pilgrimage. Ships were loaded every year with devotees to his shrine, who

carried out large sums to defray the expenses of their journey, and it appears that the pilgrims in many instances united trade with their devotion.*

Some went for payment of a vow,
In time of trouble made ;
And some who found that pilgrimage
Was a pleasant sort of trade.

An order of knighthood, denominated the Ship and Escallop-shell, was instituted by St. Louis, to induce the nobility of France to accompany him in his expedition to the Holy Land. And Guillim, in his *Display of Heraldry* says, "Such is the beautiful shape that Nature hath bestowed upon this shell, as that the collar of the order of St. Michael in France, (founded by Louis XI. in 1476,) in the first institution thereof, was richly garnished with certain pieces of gold artificially wrought, as near as the artificer could by imitation express the stamp of nature." The jewel to the collar represented the saint trampling on a dragon. It is still borne in the arms of many families, but whether legitimately, according to the poet's verse, is perhaps difficult to determine.

* Moule, Heraldry of Fish.

For the scallop shews in a coat of arms,
That of the bearer's line
Some one, in former days hath been,
To Santiago's shrine.

There are few subjects which have so long puzzled naturalists as the real nature of Sponges, whether they are vegetable or animal substances. Great names may be mentioned as maintaining each side of the question, and some indeed vacillating from one to the other, and back again. But, thanks to the aid of the microscope and the patient and accurate observations of Dr. Grant, the fact may be considered as now firmly and satisfactorily established that they are living creatures, of a low organisation indeed, but still of a most curious nature.

“Sponges,” says Dr. Johnston, “appear to be true zoophytes; and it imparts additional interest to their study, to consider them, as they probably are, the first cradle of organic life, and exhibiting before us the lowest organisation compatible with its existence.”

“Having put a small branch of the *Spongia coalita*, with some sea-water, into a watch-glass, under the microscope,” Dr. Grant says, “on

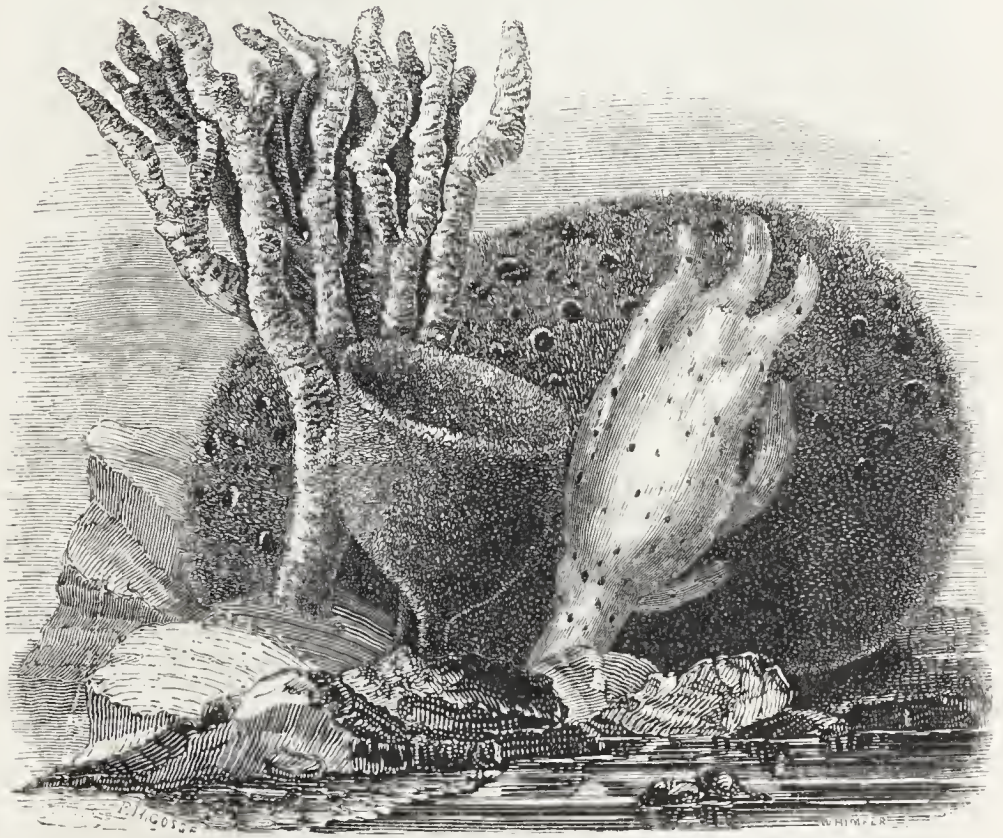


HALICHONDRIA OCULATA.

moving the watch-glass, so as to bring one of the apertures on the side of the sponge fully

into view, I beheld, for the first time, the splendid spectacle of this living fountain vomiting forth from a circular cavity an impetuous torrent of liquid matter, and hurling along in rapid succession opaque masses, which it strewed every where around. The beauty and novelty of such a scene in the animal kingdom long arrested my attention, but, after twenty-five minutes' of constant observation, I was obliged to withdraw my eye from fatigue, without having seen the torrent for one instant change its direction, or diminish in the slightest degree the rapidity of its course. I continued to watch the same orifice at short intervals for five hours, sometimes observing it for a quarter of an hour at a time, but still the stream rolled on with a constant and equal velocity. About the end of this time, however, I observed the current become perceptibly languid; the small opaque flakes which had been thrown out with so much impetuosity at the beginning were now propelled to a shorter distance from the orifice, and fell to the bottom of the fluid within the sphere of vision; and in one hour more the current had entirely ceased." From numerous experiments on many species, Dr. Grant infers that all Sponges in a living state exhibit this

sort of circulation, imbibing the untainted water by the pores, and propelling it in regular currents through the wide canals.



SPONGES.

The *Halichondria oculata* may be found hanging from the under surface of rocks about the low-water mark of spring tides. A very curious specimen of this

was found growing on the back of a small crab, a burden apparently as disproportionate as was that of Atlas, and yet the creature was seemingly little inconvenienced with its arboreous excrescence. Indeed, the protection and safety which the Crab would derive from the Sponge might more than compensate the hindrance opposed to its freedom and activity. When at rest its prey might seek without suspicion the shelter afforded amid the thick branches of the Sponge, and become easy captures; while when in motion scarce an enemy could recognise it under such a guise, and the boldest might be startled at the sight of such a monster.*

Another species of Halichondria, the Funnel shaped Sponge, is found occasionally on the shores of the northern islands, bearing an analogy to the Neptune's Cup of the Indian Ocean, vastly inferior indeed in size, but excelling it in neatness of texture and sponginess.

Some Crabs of the Caribbean Islands "have on their backs houses of Sponge excavated and fitted to their shapes, under which they lie concealed while their prey approaches. In one species the

* Johnston on British Sponges.

houses were inimitably cut, having loop-holes for the eyes, and ridges on which the dorsal legs were fixed. The sponge does not lose its vitality, though it is probably cut and modelled by the Crab, a circumstance which would assist it in deceiving the animal on which it feeds."*

A few species of the Ulvæ family are used at table. The Lacinated Purple Laver (*Porphyralaciniata*), belonging to a genus distinguished by the delicacy of colour and glossy hue of the frond, is very abundant on rocks and stones. This and the Common Purple Laver (*P. vulgaris*), if indeed they are not both the same plant distinguished only by size, is much eaten in many places, particularly in the south of England, pickled with salt, and preserved in jars, and, when brought to table, served up with lemon-juice and Cayenne pepper. It requires a little courage, perhaps, at first to taste it, but it is in general very much liked by those who once eat it. The collecting and preparing it affords occupation to many families on the north coast of Devonshire.

According to Lightfoot, the inhabitants of the Western Islands gather it in the month of March,

* Zoological Journal.

and, after pounding and macerating it with a little water, eat it with pepper, vinegar, and butter. Others stew it with leeks and onions. In Scotland and Ireland it is called Sloke or Slokaun.

A green species, most abundant, called Green Laver, or Oyster-green (*Ulva latissima*), is also served at table in the same manner as the former. This diet is esteemed good, as almost all esculent vegetables are, for scrofulous habits. Lightfoot says that the islanders ascribe to it an anodyne virtue, and bind it about the forehead and temples to assuage head-ache in fevers and to procure sleep.

A singular species, named *Ulva thermalis*, from its place of growth, was found flourishing in the hot-springs of Gastein, where the water was of the temperature of 117° Fahrenheit.

This plant, also, which is attached to the stem of the Tangle, belongs to a genus of exceedingly delicate, rose-coloured plants, marked occasionally with faint veins towards the base; the surface of its frond is also very glossy: it derives its name, Dotted Nitophyllum (*Nitophyllum punctatum*), from the seed spots which are scattered about the frond. Another common species, the Lacerated Nitophyl-

lum (*N. laceratum*), has the power of attaching itself by the edges, and creeping, as it were, upon the rocks and plants in its way; so much so, that it can hardly be gathered without some resistance and laceration.



NITOPHYLLUM PUNCTATUM.

You intend, you say, to take home some of the sea-weeds and dry them, as the beginning of a collection which you purpose making. Their beauty is the chief attraction at present, but at some

future, and no distant period, you will study them scientifically. I need not say how very cheerfully I will do my best to assist you, and make the study as easy as possible. Some difficulties you must expect to meet with, but they are not of such a kind as to deter any one who is really anxious to master them. That which so many have successfully accomplished is quite within your reach ; and you will find, when I have explained practically from the living plant what is the meaning of the several terms employed, that you will soon understand the scientific description sufficiently to enable you to ascertain the genus to which the specimen belongs. This is a great point gained, and a capability of distinguishing the species will soon follow. Do not be alarmed by what are thought hard words, and never pass by a term without knowing thoroughly what is signified by it.

Now, with regard to drying the plants, I will begin with the coarser Fuci. Of these I should advise you to select not very large specimens, as they are inconvenient for the herbarium ; but you must always procure such as are in a state of fructification if possible, and which possess the cha-

racteristic distinctions of the genus to which they belong, and these may be usually found of no very great length.

Gather those which have nothing foreign growing upon them; such specimens are usually met with about mid-way between high and low-water mark. Sometimes, however, an additional interest is given to a plant from its being the support of another, or from some species of zoophyte attached to it. In the case of the Knotted Fucus, a specimen should be kept with the *Polysiphonia fastigiata* upon it, that being the favourite habitat of the Conferva.

These must be well washed in fresh water, and carefully wiped to remove the slimy exudations common to some; they are then to be carefully laid out in their natural position upon white paper, and covered with pieces of common, but not coarse, calico, the number of which will depend upon the thickness of the plant: upon this other specimens, similarly treated, may be laid, and some heavy weight put upon the whole. The thinner Fuci, and the Ulvæ, will require very little pressure, and some will adhere to the calico if not carefully managed. This is far better than paper as a

covering, as it absorbs the moisture more readily and more effectually ; and the more frequently it is changed the better. When the plant is thoroughly dry, if it does not adhere to the paper of itself, either gum may be used to fasten it, or the stem and parts of the frond may be stitched down with thread. The name of the plant, the place where, and the time when it was found, to be written underneath. The *Confervæ* should also be procured when in fruit : this may be discovered, even in very minute species, by means of a pocket magnifying-glass ; and, as several have a double kind of fructification, both should be procured, if they can be met with. When collecting these, be careful to obtain growing specimens if you can, and such as are not infested or injured in the colouring. Frequently rare species are met with among the masses of weed washed up by the tide.

These, being more delicate, require a greater degree of care in the drying. They must first be washed in fresh water till every impurity is removed, then put into a shallow dish nearly full of water, (a large pie-dish is as good as anything,) and allowed to float out till they assume their natural mode of growth. Then a piece of paper,

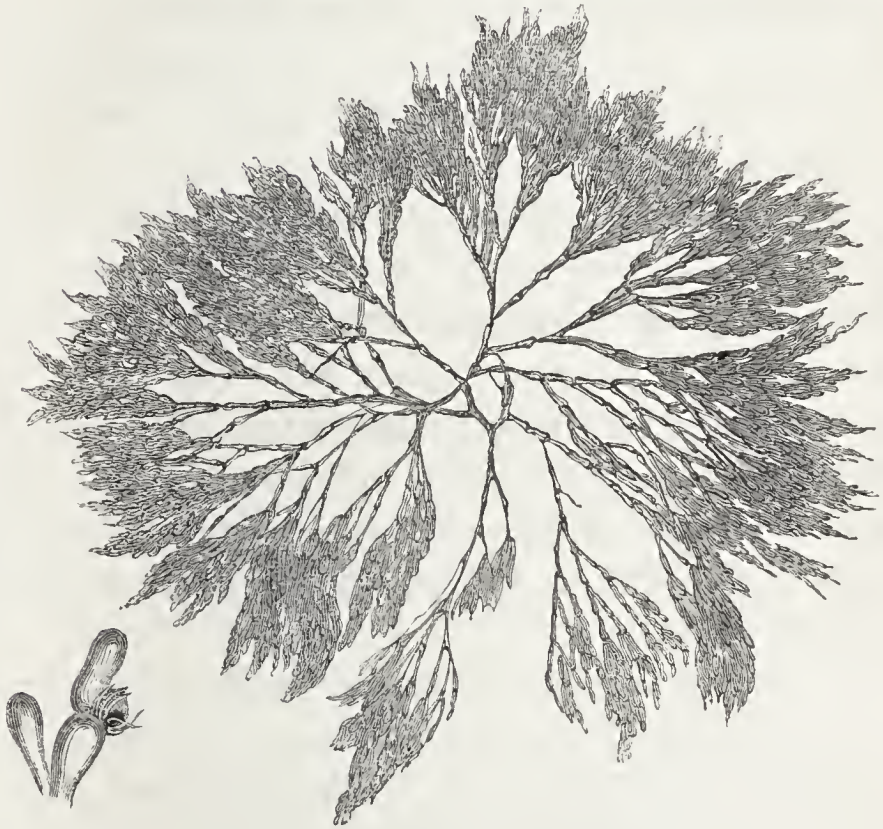
previously wetted, must be gently introduced under the plant while it is floating; this, being carefully raised, will generally preserve the plant in its proper form, and will require very little spreading out afterwards. Should this be requisite, on no account use a pin, as that will tear the delicate fibres: a piece of soft wood cut to a blunt point is the best instrument for the purpose. A little practice will soon give all the necessary skill. When spread out upon paper, calico is to be used as in the former instance, and but little pressure is to be employed. Change the calico frequently, as the sooner the specimen dries the better the colour will be preserved. The name, habitat, and date to be written as before.

Two singular plants are here together, the genus of which has been named *Griffithsia* by Professor Agardh, in honour of Mrs. Griffiths of Torquay, a lady whose knowledge of sea-plants stands unrivalled, and to whose long-pursued and acute observations every writer on the subject stands most materially indebted. Residing near a coast peculiarly rich in such productions, she has been enabled, by the facilities afforded her of examining living specimens, and by her nice powers of discri-

mination, not only to correct the mistakes of others who did not possess similar advantages, but also to furnish such accurate descriptions as will prevent all future errors. Many ladies, indeed, have been very eminent in this department of Botany. Dr. Greville alludes to this pleasing fact in the introduction to his work on the *British Algæ*. “It is not without a feeling of extreme pleasure,” says he, “that, by means of the present work, I shall place in the hands of my fair and intelligent countrywomen a guide to some of the wonders of the great deep; nor need I be ashamed to confess that I have kept them in view during the whole undertaking. To them we are indebted to much of what we know upon the subject. The very beauty and delicacy of the objects have ever attracted their attention; and who will deny the rationality of that admiration which is expended on the works of an Almighty hand, or censure as trifling the collecting of things, even in the absence of information concerning them, which, if contemplated as they ought to be, can only tend to refine the mind and raise its sentiments?”

The larger plant is the Coralline *Griffithsia* (*Griffithsia corallina*), of a bright pink colour, the

partitions of which in the main stems are well marked by the swollen joints, which give the plant the beaded appearance of a coralline, whence its



GRIFFITHSIA CORALLINA.

name. These joints, when the plant is dried, are dark, from the colouring matter of the other part having been discharged, as I shall explain to you

by and bye, and they become gradually shorter in the smaller branches. Age and exposure to the sun affect the colour very much; it becomes lighter, and is often tinged with green. In drying it frequently loses much of its colour, and the paper, to which it adheres very firmly, is often tinged with a beautiful carmine, which will remain unchanged for years.

The Bristly Griffithsia (*Griffithsia setacea*) is a more rigid plant than the former, and grows in thick bunches from four to five inches in length: the colour is a rich crimson, very fugitive, which exposure to the air will change to a dirty orange. This, like the last, gives out its colour in fresh water, and no doubt a fine lake could be obtained from it, could it be procured in a sufficient quantity.

Griffithsia setacea, when first gathered, possesses a considerable degree of rigidity or firmness, but, after being immersed in fresh water for a short time, loses that firmness, and becomes flaccid. Not only does it undergo these changes, but when it has been in the fresh water for a short time, it makes a crackling noise like a weak spark from an electrical machine, or as salt does when thrown

into the fire. Dr. Drummond of Belfast has given the following interesting account of his experiments upon this plant :—

“ I poured some fresh water on a common white plate to the depth of about one twelfth part of an inch, and in this I put a portion of this plant quite fresh from the shore. It remained for several minutes quite still, and then some of the divisions of the frond exhibited sudden startings like spasms. I had repeatedly before been amused by watching this appearance on a larger scale, though with the naked eye, by putting a bunch of the plant in a basin of water. When so placed it soon assumes the appearance, to a considerable degree, of being animated ; instantaneous startings are observed in the chief branches, along with lateral motions of the smaller branches, which are seen to move towards or to diverge from the former.

“ But the cause of these startings, and of the consequent motions of the branchlets, was more obvious, by observing what passed in a portion of the plant laid in a thin stratum of water on a plate, as above alluded to. Whenever the startings took place, a change began to take place also in the colour. The joints of the plant are filled

with the coloured fluid, and while it is in the salt water the partitions (septa) between the joints remain entire ; but when the influence of the fresh water is felt, the partitions burst, and the contents of one joint are exploded into the next, the colouring matter at the same time losing its uniform tint and curdling into grains. From the violence with which the contained fluids are urged through the partitions in the joints, breaches form in the sides, also, of some of them, and then at every new spasm a quantity of the colouring-matter is hurried through these breaches into the water. The latter explosions present under a common magnifier an extremely interesting appearance. They are instantaneous, and when the projected fluid has attained its extreme distance, the colouring-matter suddenly settles in a crowd of dark grains, so as to give not an unlively idea of a bomb-shell in the act of bursting. Sometimes several of these occur in rapid succession, and again half a minute or more intervenes between them."

The pink weed, which covers with such profusion the sides of this shallow pool, and spreads, indeed, over the bottom of it, is the Common Coral-

line (*Corallina officinalis*), a production which for a long time, like the zoophytes, held a most debatable position, and which, even now that its structure is satisfactorily ascertained, occupies no settled place in the arrangement of natural history. Its calcareous crust, however, which is jointed at short and regular intervals, covers a decided vegetable stem. And, whatever may have been the doubts of former naturalists, they must be considered as set at rest by the experiment of Dr. Johnston:—"It is now eight weeks since I placed in a small glass jar, containing about six ounces of pure sea-water, a tuft of the living *Corallina officinalis*, to which were attached two or three minute *Confervæ*, and the very young frond of a green *Ulva*, while several little *Mussels* and a *Starfish* were crawling amid the branches. The jar was placed on a table, and was seldom disturbed, though occasionally looked at; and at the end of four weeks, the water was found to be still pure, the mollusca and other animals all alive and active; the *Confervæ* had grown perceptibly, and the *Coralline* itself had thrown out some new shoots, and several additional articulations. Eight weeks had now elapsed since the experiment was

begun, the water has remained unchanged, yet the coralline is growing, and apparently has lost none of its vitality, but the animals have sensibly decreased in numbers, though many of them continue to be active, and shew no dislike to their situation. What can be more conclusive? I need not say, that, if any animal, or even a Sponge, had been so confined, the water would before this time have been deprived of its oxygen, would have become corrupt, and poisonous to the life of every living thing."

This Coralline, when dead or cast on the shore, soon loses its deep pink colour, fades to a pale pink, and in a few days becomes entirely white. When put into fresh water the colour immediately weakened.

OUR walks have now ended, and you readily confess that you have derived peculiar pleasure from the examination of the different objects which I have brought to your notice, have been astonished at their various beauties, and are determined to be better acquainted with them. Follow up this wise resolve, you cannot know too much of them. In the words of Milton—

Thy desire, which tends to know
The works of God, thereby to glorify
The great Workmaster, leads to no excess
That reaches blame, but rather merits praise
The more it seems excess ;
For wonderful, indeed, are all His works,
Pleasant to know, and worthiest to be all
Had in remembrance always with delight.

You must have observed, however, how small a portion we have examined of what we have seen, and how countless are the objects every where around us, waiting, as it were, for man's notice and attention; for, as old Purchas says, "The praise of God's wisdom and power lies asleep and dead in every creature, until man actuate and enliven it. I cannot, therefore, altogether conceive it unworthy of the greatest mortals to contemplate the miracles of nature, and those are more visible in the smallest and almost contemptible creatures, for they most lively do express the infinite power and wisdom of the great Creator, and erect and draw the minds of the most intelligent to the first and prime cause of all things, teaching them, as the power, so the presence of the Deity is in the smallest insects."

Still we ought carefully to set a watch over

ourselves, even in our admiration of these things. Many are too apt to behold the glories of creation without looking beyond. They are satisfied with a vague, sentimental feeling of beauty, and think not enough of that hand from which all beauty flows. They are struck with the endless adaptations of the material world, but do not always sufficiently raise their thoughts to the Great Designer, and thus fail to reap all the advantages which such contemplation is calculated to give. But to a mind accustomed to consecrate all its perceptions of beauty and design to the inward worship of God, every mountain, field, and shore, every plant and animal, teems with instruction.

Go, ask thy heart, what spirit thus abides
In every region—thus minutely works
In deserts ; and thy heart shall answer,
“ It is God.”

The End.

